THE AMERICAN GAS LIGHT JOURNAL

REDMANRKENNY.N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXII. No. 25. Whole No. 1,306. | NEW YORK, MONDAY, JUNE 18, 1900. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $5 (£1—25 francs). All payments to be made in advance. Single copies, 10 cents.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—

Correcting the Published List of New Members, Western Gas Association 965

Eighth Annual Meeting, Pacific Coast Gas Association..... 965

EDITORIALS

Briefly Told 965

Storage, Service and Profit—Notes.

Proceedings, Twenty-third Annual Meeting, Western Gas Association- Official Report—Revised by the Secretary Concluded from Page 937..... 966

Second Day, Morning Session—The Hygienic Effect of the Use of Gas, by Mr. Thomas D. Miller—Discussion—Second Day, Afternoon Session—Telescoping a Gasholder, by Mr. James Somerville—Discussion—A Central Station Electric Plant Operated by a Gas Engine, by Mr J C. Small—Discussion—In the Matter of a National Bureau of Advertising—Report from the Committee on Cyanides—*Reading the Wrinkles—To Publish the Record of Wrinkles in Pamphlet Form—Report of Committee on Isolated Generators for Bench Firing—Some Routine Business—The Question Box—Report of Committee on Final Resolutions—Adjourned.

Operating Economies in Central Station Practice, by Mr. W. L. Abbott 979

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 981

Gainesville (Fla.) Plant to be Operated on Municipal Account—Mr. W. R. Addicks Makes a Correction—A Hint from Kenton, Ohio—Annual Meeting, Toledo, Ohio—Annual Meeting, Binghamton, N. Y.—Prof. Bemis again a Gas Expert—The Gas and Electric Lighting Interests of Kenosha, Wis., are combined—Extending the Factories of the Western Gas Construction Company—Annual Meeting, Pawtucket, R. I.—Ex-Mayor Latrobe succeeds Capt. Hall as President of the Baltimore Consolidated Company—Decision in the New Bedford (Mass.) Gas Rate—And Other Items.

The Market for Gas Securities..... 982

MR. JAMES W. DUNBAR, Secretary of the Western Gas Association, informs us that our report of the election of new members at the last meeting of the Association was incomplete, in that it should have included the names of Messrs. J. C. Sloan, Supt., Port Huron, Mich., and P. S. Young, Asst. Treas., Hudson County Gas Company, Jersey City, N. J.

[OFFICIAL NOTICE.]

Eighth Annual Meeting, Pacific Coast Gas Association.

OFFICE OF THE SECRETARY,
415 POST STREET, SAN FRANCISCO, CAL.,
June 10, 1900.

The eighth annual meeting of the Pacific Coast Gas Association will be held in San Francisco, Cal., at the office of the San Francisco Gas and Electric Company, 415 Post street, Tuesday, Wednesday and Thursday, the 10th, 11th and 12th of July, 1900.

The following papers will be read:

"President's Address," by Mr. John Clements.

"The Investigation of Gas Processes," by Mr. Alex. C. Humphreys.

"Thoughts on Boilers and Their Explosions," by Mr. T. R. Parker.

"The Best Method of Introducing Gas Stoves," by Mr. John A. Britton.

"The Synthesis of Commercial Gases," by Mr. L P. Lowe.

"Some Notes on Larger Types of Gas Engines," by Mr. J. B. Crockett.

"The Use of Crude Petroleum for Firing Benches," by Dr. R. M. Powers.

"Prepayment Meters, by Mr. C. R. Collins.

"Wrinkle Department," edited by Mr. G. H. Hollidge.

"Experience Department," edited by Mr. O. M. Gregory.

The customary "Outing" will be made to some point of interest to be announced later.

Prior to and during the meeting the Secretary will be at headquarters, 415 Post street, and on Monday evening, July 9th as well, where he will be glad to meet members and furnish information.

Members are requested to send in questions for the "Question Box" not later than July 1st.

J. B. GRIMWOOD, Secretary.

BRIEFLY TOLD.

STORAGE, SERVICE AND PROFIT.—Those engaged in the business of supplying others with what the others need are employed in trading that is difficult to compass. When the patron, consumer, user, or by what name he may be headed, is ready, the server must be alert and up to the demand made upon him. If the user is ill, the server must be well; if the user is only weak, the server must be strong; but in any event the server, to earn proper return, must never be ill, not even weak. It may be somewhat difficult to reconcile this introduction to a paragraph or two on the lighting situation, with the title of "Storage, Service and Profit," yet the application is there just the same. Capitalists are willing to supply light to those who want it at a

rate that looks profitable; users are willing to take light at a rate that meets with their seeming needs. Between the former and the latter no agreement has yet been reached; nor will such agreement be reached until the significance of yes or no is changed. In such understanding service and use are of necessity widely divergent, so we may come to the point that those who serve best reap most. This brings us to the queer expression made by Mr. Henry L. Doherty, of St Paul, Minn., in a paper read by him at the 23d convention of the National Electric Association, held in Chicago last month. The title of his paper was "Equitable, Uniform and Competitive Rates," and it is quite certain that its main arguments had to do with rates for electric lighting, as that means of illumination may be conveyed to users from a central station. As no gas man yet knows of equitable or uniform rates for electric lighting from a central station, we may dismiss the "equitable and uniform" from the present review, considering wholly the "competitive" feature of his plea. Respecting the latter, Mr. Doherty said: "As one of the chief factors in determining the proper methods of charging is to meet competition, a short consideration of this subject is not out of place. It is probably necessary to consider only the sources of competition named below. I give the first three of them in the order that I consider to be their future importance: First, natural light; second, isolated plants; third, mineral oil; fourth, gas." Going on, he says: "I do not attempt to place gas in any order of importance, as its future is largely problematic." From a gas man's point of view Mr. Doherty is quite right in two of his objections. If there were bright daylight all the time, the legislatures, or whomsoever the law-making power might be, would never be concerned in "fixing" gas rates, and gas shares and even gas bonds would not be in sensible demand. So far as isolated plants are concerned, the gas man has had his try with them, always to the discomfiture of the "isolated" description, when his mains were ready to cut out the isolation through the natural growth of profitable territory. The instance of mineral oil is one of much concern to the gas man, for he knows quite well, having competed with it for well over a third of a century, that the lamp in which it burns is much more easily transported from place to place than his gas works, his mains, services and fixtures. So we come to his fourth "problematic" competitor in the establishing of competitive rates—gas. If someone could arrange for the storing of "natural light," to be served out as those who needed it wanted it, it would be good bye to gas; if everybody could afford to be his own gas maker, then we would have an example of each one serving himself cheaply, without recourse to a central gas station, and that would be very bad for the latter; the trouble with mineral oil the gas man will likely encounter until the price thereof goes to a point where the electrical man will have a chance to compete with him in any sense over the respective cheapness of their trading. And, in the end, if the electrician devises some method of storing his current, to be drawn upon as the gas man draws upon his store, to be used in time of "peak" work, but always ready to respond to the dragnet without extra expense, then may those who manufacture and store gas, for service and profit, realize that the electric current can in commercial working affect them sensibly in respect of their earning a fair livelihood. The storage question is the vital one for Mr. Doherty and his co-laborers to consider; having solved which they may be able to talk seriously about competitive rates between gas and electricity.

NOTES.—Some days ago, Mr. William Burris, a resident of 330 Jerome street, Brooklyn, N. Y., while experimenting with calcium carbide in attempting to light his home with acetylene gas, received injuries that resulted in his death.——The proprietors of the Bangor (Me.) Gas Light Company have put their selling rate at $1.50 per 1,000 cubic feet, a concession of 10 cents per 1,000. The new price goes into effect the 1st July.——The annual picnic and feast of the Mutual Benefit Association of the H. Mueller Manufacturing Company, of Decatur, Ills., will be held at Mackinaw Falls, Ills., the 23d inst.——Mr. Oscar T. Weber, Secretary of the Oakland (Cal.) Equitable Gas Company, has notified the shareholders of that concern that an assessment of 20 cents per share has been levied upon "the subscribed capital stock of the corporation." The delinquent day was named for June 10th, and the selling-out day, in consequence of the delinquency, is fixed for the 28th inst.——At the annual meeting of the Reading (Pa) Gas Company the officers elected were: Managers, Wm. R. McIlvain, Chas. Breniser, Isaac Hiester, Wm. A. Arnold, Ed. D. Smith, John L. Kutz and Wm. D. Smith; President, Wm. R. McIlvain.——Mr. Willard Parrit, for many years in charge of the Bloomington (Ills) Citizens Gas Light and Heating Company, and subsequently Superintendent of the Union Gas and Electric Company, when that concern was formed to operate the gas and electric lighting supply of Bloomington, has retired from active business.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONCLUDED FROM PAGE 937.]

PROCEEDINGS, TWENTY-THIRD ANNUAL MEETING, WESTERN GAS ASSOCIATION.

HELD IN THE AUDITORIUM HOTEL, CHICAGO, MAY 16, 17 AND 18, 1900.

SECOND DAY—MORNING SESSION.

The President—Introduced Mr. Thomas D. Miller, of Dallas, who read the following paper on

THE HYGIENIC EFFECT OF THE USE OF GAS.

In his "Floating Matter in the Air," Prof. Tyndall demonstrated that floating in the air are germs in greater or less numbers, which will propagate when deposited in a fertile material. Infusions of beef and mutton juice were found to ferment in a few hours after sterilization, if left exposed to the ordinary atmosphere, while upon sterilization and exposure to an atmosphere entirely devoid of floating matter the infusions were found to remain sweet and unchanged indefinitely at any temperature. A small surface of gelatin, properly prepared and exposed for a few minutes in a room filled with people, even though the room be well ventilated, will develop on its surface a large number of colonies of bacilli, while a similar surface exposed in a quiet atmosphere of an unoccupied room will develop very many less colonies.

Prof. Tyndall took several tubes of sterilized infusions hermetically sealed to Mount Blanc. Some of the tubes failed to ferment upon being opened in the pure atmosphere, while those that did ferment were very sluggish. The fertility of all was demonstrated by means of dust from desiccated hay. Prof. Tyndall also demonstrated that he could destroy the life of all atmospheric germs by passing the air through a tube heated to redness.

The theory of bacterial source of a large number of diseases is now generally recognized as correct. The atmosphere of an ordinary living room in cool, bracing weather, will be comfortable with several occupants in the room for a number of hours with no apparent ventilation. In warm weather this room would become insufferable in a few minutes without ventilation or some sort of a fan. As a matter of fact the much talked of ventilation is often necessary, not as a sanitary requirement but for reasons appealing solely to the comfort of the occupants. That is to say, ventilation may not be necessary from a hygienic standpoint, and yet quite necessary as a matter of comfort. There are few rooms occupied ordinarily in which the natural diffusion of the air will not keep the room supplied with sufficient oxygen for wholesome breathing. A room would have to be built of extremely impervious material, unusually well put together, to be otherwise. Motion in the atmosphere is a thing that is most sought in the effort at ventilation. An atmosphere at a temperature of 90° will not prove very oppressive if the air is kept well in motion, and the dryer the air is the less the heat will be felt, and *vice versa*. Therefore, in heating apartments comfort will be felt in a moist atmosphere at a lower temperature than in a dry atmosphere. For hygienic reasons the moist atmosphere is regarded as the more desirable, and for economic reasons it would seem to be so. Therefore, all heating apparatus will accomplish its work more satisfactorily and more economically if it furnishes a moist heat or atmosphere.

Prof. Arche, of Vienna, in "Der Gastechniker,"[1] recently had an article on "Moisture in Gas Heated Rooms."

In it he says, "The earlier investigations into the subject of heating by gas were concerned with questions of temperature results, fuel consumption and cost, as also with questions of contamination of the air by the products of combustion. The effect of heating by gas on the degree of moisture or dryness in the room has not yet been inquired into. The moisture in the air should not fall below 40 or rise above 75 per cent. of complete saturation, else there is discomfort, or even mischief; and, therefore, a room with damp air needs to be warmed; a room with dry air may need to be cooled." In the experiments described the instrument employed was Lambert's Polymeter: "With this instrument the observer may at once find (1), the temperature of the room (2), the percentage of moisture in the air (3), the saturation pressure of water vapor (4), the maximum quantity of moisture which the air can carry, and (5), the difference between the actual temperature and the dew point." Observations were taken hourly in the open air in a living room and in school rooms on three different occasions, viz: May 27th and November 28th, 1898, and February 22nd, 1899. The rooms were unwarmed on the occasion of the May 27th observations. November 28th the living room was heated by a clay stove, the

1. Translated by the "Gas World," Dec. 23, 1899; "Progressive Age," Feb. 1, 1900.

school room by an iron stove, and while the atmosphere showed a normal saturation the school room at no time showed as high as 40 per cent. moisture. Quoting Prof. Arche: "Mere heating is thus proved inadequate to keep the moisture of the air sufficiently high; the air becomes too dry. Evaporation is very inconvenient with the stoves used, and the question arose whether the use of a gas stove would not do what was required. In the living room a Siemens gas stove was used; in the school room already referred to, a Warstein gas stove was used with a water evaporator; and in another school room a Siemens gas stove was used, also with a water evaporator.

"The external air was very dry on the day chosen for the tests, but in the living room and in the more unmanageable school rooms the moisture and dew point were kept within perfectly satisfactory limits; and a comparison of the results shows what a marked improvement had been produced, even though the building had not yet become seasoned to the new method."

The contamination of the atmosphere in inhabited closed rooms will be due to exhalations of the lungs and body. The question of vitiation of the atmosphere is treated of by Mr. Norton H. Humphrys in his work, "The Chemistry of Illuminating Gas." He says the earliest investigators "regarded products of combustion as a sort of necessary nuisance, and held that the smaller the quantity generated the better. * * * To a certain extent this is correct, but not in its entirety. * * * The question is intermixed with ventilation. * * * It happens that most of the places where artificial light is required are used or inhabited by human beings; and, therefore, efficient ventilation is necessary, apart from all questions relating to artificial light. * * * A room in which a gas burner cannot be used without producing evidences of insufficient ventilation is, therefore, unfit to be occupied by even a small number of persons for any length of time. If an electric light is substituted for a gas burner (in such a room), the defect is concealed rather than remedied."

The products of combustion from illuminating gas are water vapor and carbonic acid.

Mr. Thomas Wills, in a lecture before the British Association of Gas Managers, in 1878, says: "The normal proportion of carbonic acid present in pure country air is 4 parts in 10,000," and calls 6 parts in 10,000 the healthy limit. Good authorities agree that a mixture of 2 per cent. pure CO_2 with air is harmless and can be breathed with impunity for a long period. I think we are justified in presuming that this vitiation referred to is not caused by the presence of carbonic acid. As a matter of fact, carbonic acid does not vitiate the atmosphere in the sense that carbonic oxide does. It is only a non-sustainer of respiration, and is no more harmful to inhale when mixed with air than the nitrogen which we inhale as a part of the air. Then, why is it that the impurity of the atmosphere is determined by the percentage of carbonic acid present? Is it not a fact that the carbonic acid is the index of contamination? The organic matter exhaled from body and lungs of human beings will be in proportion to the amount of carbonic acid exhaled, therefore the impurity of an atmosphere in an inhabited room can be determined by the percentage of CO_2 present, and any improvement in ventilation would show a reduction in that percentage, but it would not be a fair comparison to take fresh mountain air and determine its purity by the same standard, because it might have 10 parts of CO_2 in 10,000, and not have a particle of organic matter in it. It would, therefore, seem from a hygienic standpoint the object of ventilation is to remove by mechanical mixture and draught these objectionable particles, and not the carbonic acid and moisture produced by combustion and breathing. This being the case, then any process that would destroy these obnoxious particles of organic matter would aid the ventilation to that extent.

The dark spot on the ceiling which gradually appears and grows darker over a gas jet is ordinarily attributed to smoke from the gas. It is hardly necessary for me to remind you that such is not the case. These sooty deposits are nothing less than charred and inert particles of organic matter that have passed through the gas jet, and, rising in the current of hot air, have been deposited on the ceiling, and it is impossible to say how many millions of deadly disease germs are hourly cremated in this way. In the sick room where a contagious disease is, the presence of germs may be so numerous as to make the air infectious, and in the presence of an infectious disease the danger is well known. The tubercle bacillus is perhaps, the most prevalent disease germ of all dangerous diseases, and there is no doubt that every one inhales and swallows in water and food many thousands of them every year. And these same bacilli will stop and colonize if they find fertile soil, and then there is a case of consumption.

Prof. Tyndall has shown that the atmosphere was sterilized by passing through tubes heated to redness. Then it is no far fetched conclusion that air passing through a gas flame is improved from a hygienic standpoint. And this improvement is certainly not diminished by the passing through the chimneys of the argand and incandescent burners and tubes and walls of gas heaters. That this destruction of organic matter goes on is evidenced by the sooty deposits already referred to, and that will always be found about the inner surface of the upper parts of gas heaters. Of course this destruction goes on in the ordinary coal and wood stoves and grates, but the immediate benefit is lost because the air so sterilized is carried out of the room through the flue, while with a properly constructed and operated gas heater no flue is necessary, and the sterilized air is allowed to remain, except so far as the natural ventilation will remove it.

True it is, for every foot of air carried out of the room by the open flue there is another foot of fresh air brought into the room. To what extent does this benefit the atmosphere of the room? The cold air entering the room to replace that which passes out the flue will enter as near the level of the floor as possible, and float along near the floor toward the fire to be immediately carried out of the room through the flue to again be replaced by more fresh air, all the while leaving the warm air which carries the contaminations floating above, and in that portion of the room the occupants are breathing. So that the benefits derived from this source are slight at most.

Diffusion Test with Gas Heater.—The room selected is on the first floor of a residence. The building is well built, and doors and windows reasonably tight. The walls and ceiling are plastered and painted with three coats oil paint. The room is 12 by 15, with 10 ft. ceiling. The heater stood in one corner. Observer "A" was stationed near the ceiling in the corner diagonally opposite the heater. Observer "B" was stationed directly beneath "A" and close to the floor. A small quantity of pungent volatile oil extract was dashed upon a piece of paper, which was held in the heated air currents rising from the heater. The odor was detected by observer "A" in 25 seconds and by "B" in 36 seconds. In one minute the whole room was permeated by the odor.

At the risk of being severely criticized, I introduce the results of two experiments in diffusion or circulation of atmosphere in artificially heated rooms. The outside temperature at the time these experiments were made was 50° F., and the temperature of the room was about 75° F.

Diffusion Test with Coal Grate.—The room selected is exactly the same shape and size as the one used for the gas heater, and is located directly over it, and the walls and ceiling plastered and painted in same manner. All conditions are the same, except that the room with the gas heater has no flue opening. The grate is what is known as the "Club House" grate, 27 inches wide and 29 inches high, is in a corner, and the observers were located in the same positions relatively as in the gas heater experiment. The odor was detected by observer "A" in 50 seconds and by "B" in 65 seconds, and it was 1 minute 45 seconds before the odor was observable throughout the room.

Diffusion through the walls will be more rapid, the greater the difference in the temperature of the outer atmosphere and the room, therefore, the colder the weather and the more artificial heat needed the less need there is for artificial ventilation. Motion in the atmosphere is essential to hygienic conditions. The simple act of breathing in a room produces a certain amount of motion in the atmosphere, not from the exhalation of the breath alone, but from the elevation in temperature in the products of respiration, causing them to rise and allowing fresh air to take their place for inhalation. Such of these products as are not carried out of the room by diffusion or ventilation will, when cooled, settle towards the floor and circulate about the room to be inhaled again unless destroyed.

What the process of breathing accomplishes toward producing circulation of the atmosphere, the gas jet, incandescent gas burner and gas heater do also in proportion to the heat developed, with the additional advantage of destroying much of the organic matter floating in the air.

It may seem to be going rather far, but I believe the presence of any force or substance that will tend to destroy, or render inert, bacilli, even in a small degree, so long as it is not obnoxious, is a good thing to have about and in operation. For instance, the old lucifer match is an obnoxious thing to use, and yet every particle of SO_2 generated in lighting one in the house paralyzes a certain humber of microbes that may be about looking for jobs. This is true to a certain extent, or the system of fumigation practiced in times of epidemic is a mere formality. Under these circumstances, then is it such a grave offence if a little sulphury gas gets into the holder and fumigates the town once in a while?

The general introduction of the instantaneous water heaters for bathing purposes is for better hygienic results, and not alone because of the

increased facilities for bathing. For years I opposed the use of the cheaper class of water heaters even for bathing purposes, where the products of combustion commingle with the water. I have since changed my views. The products of combustion coming in contact with the copper of the heater form a soluble copper compound, but only a small quantity however. The warm water takes this up and the bath then has a slight trace of copper compound in it. It is a well established fact that many annoying cutaneous troubles come from germs introduced from the exterior. Boils, carbuncles and such pleasantries are produced by germs introduced from the surface of the skin. All copper solutions are death to these germs, and a regular bathing in water such as just described will have a tendency to render immunity from many of the troubles suggested.

While some of the conclusions herein are possibly not fully warranted, it is to be hoped that the day is near at hand when more definite information will be obtainable than at present, and this paper is written in the hope of suggesting lines of investigation which have not heretofore been followed so far as I have been able to ascertain. And I feel that these conclusions, if carried to their ultimate, would warrant the statement that when the time comes that all heating will be done by steam, water, or, perhaps, some other method not dreamed of, eliminating the open fire, and all lighting is done by the incandescent electric or other inclosed glow lamp, that then infection or contagion will be much more prevalent than it is now or has been in the past, unless some method be invented in the meantime to exterminate the microbes.

Discussion.

The President—Mr. Miller's very interesting paper on a somewhat novel and important subject is now before you for discussion. Will Mr. Ferrier take the lead?

Mr. Ferrier—I presume from the paper that in the experiments which Mr. Miller describes he used a stove without a flue, and I have made some calculations upon the effect that such a stove would have in the room. The area of the walls of the room described by Mr. Miller would be 540 square feet. The quantity of gas required during the first hour to raise the temperature 25° above the outside temperature would be about 22½ feet. The quantity of carbon dioxide at the end of the first hour, after allowing 15 per cent. for absorption, would be about 10.2 feet, and the quantity of oxygen abstracted from the atmosphere, after allowing 50 per cent. replacement, would be about 13 feet. At the end of the first hour, instead of having 6 parts of carbon dioxide per 10,000 we would have nearer 60, which is hardly a desirable atmosphere. The probable per cent. composition of the atmosphere at the end of the first hour would be: Oxygen, 20.17; carbon dioxide, .56; nitrogen, 79.27. But the evil unfortunately does not stop there. It is cumulative. When an atmosphere contains that amount of carbon dioxide, and when the zone of vitiation descends to the level of a stove, you have this vitiated atmosphere entering the stove with the air; and that, as I have reason to believe, produces incomplete combustion, with its concomitant evils. On page 7 Mr. Miller says: "Diffusion through the walls will be more rapid the greater the difference in the temperature of the outer atmosphere and the room." It should not be forgotten that that tendency to efflux will reduce the tendency to the influx of fresh air into the room. So I think that, where no provision is made for the removal of the products of combustion, either by convection or by absorption, which is possible, heating by gas is not going to be a success from a hygienic standpoint. On page 3 Mr. Miller mentions experiments made with clay stoves. These, I suppose, were stoves made of clay for the purpose of avoiding the injurious effects of great surfaces of heated iron. It has been demonstrated that germs in contact with heated iron evolve cyanogen, which is the probable cause of the headaches which many experience in the vicinity of a hot stove. The heating of the future will have to be done more by reflection. Regarding the hygienic effect of lighting by gas, I have no hesitation in saying that the Welsbach burner affords the most healthful mode of lighting now in vogue. The amount of vitiation that it causes is almost imperceptible, and is more than off-set by its advantages as a germ crematory. I think the progress of hygiene means a greatly increased use of gas. I do not think I draw any fancy picture when I say that we will see in the future gas burners in the ceiling drawing the vitiated air from the room, with suitable arrangements for throwing heat and light down when required at the same time that they are drawing air into the room through porcelain tubes heated by gas. In summer time air could be drawn in through tubes filled with sterilizers. I think it would be a good thing for the various Associations to get together and have some of these things demonstrated by well known scientific men. It would be something which would dispose of a great deal of the nonsense which is talked on this subject, and it would guide gas men in advising their consumers.

Mr. Egner—I am pleased to see that the Western Gas Association has a member so well endowed with medical skill as to treat this subject in the way that Mr. Miller has done. I move a hearty vote of thanks to Mr. Miller for his paper. (Carried.)

An adjournment was ordered to 2 P.M.

SECOND DAY, AFTERNOON SESSION.

The Association met at 2 o'clock P.M. The proceedings were commenced by the reading of the paper, by Mr. James Somerville, of Indianapolis, Ind., on

TELESCOPING A GASHOLDER.

The only justification I have for bringing this short topic before you is that in the times we live in anything that tends towards economy in construction is worthy of consideration by us. It became needful last year to telescope our 80-ft. by 22-ft. holder at our water gas plant. At first I intended to proceed in the usual way to make the present inner section the outer section, but finding I had 13 inches of space between the wall plate of tank and sheets of holder, I concluded to put the outer section in that space, thereby keeping the crown of holder intact, increasing the capacity some 8 per cent., and possibly reducing the cost of construction.

In asking for propositions, I specified that they should bid for doing the work in the usual way, and also in the way I intended adopting. One firm of builders was perfectly willing to undertake the work as I required; another was not quite sure about it; and the other refused to bid, not caring to take the responsibility of what must have appeared to him a new departure. But as they gave no good reason why the holder would not work satisfactorily constructed in the way I suggested, and as the difference in cost was 25 per cent. less in favor of my plan, I determined to go on with the work. The cup and grip took up 9 inches of my space, the bottom curb 2½ inches, which left 1½ inches for the bottom rollers, which were made barrel shaped.

The work proceeded and was completed without a hitch. The two bottom sheets of the inner section were removed. They were replaced with stronger plates, with the cup riveted to the bottom one. On the bottom of the cup were bolted the rollers to work against the rubbing bars, which were riveted to the inside of the outer section. The curb of the outer section, which consisted of two rings of 3 by 2½ by ¼ inch steel angles, each weighing 8½ pounds per foot, was laid out, to which the plates of the outer section were riveted and let down into the tank by suitable pulleys as the work proceeded. To the top of this section was riveted the grip, and on top of the grip were bolted the tangential rollers. The crown was strengthened by a secondary curb placed about 2 feet in from the outer curb. Tangential rollers were also placed on the inner section. The new columns had to be set back 12 inches to allow the enlarged outer section to pass the middle girders. The holder has been working 8 months, subjected to some severe gales, but so far I have not detected the slightest variation of level.

The increase of pressure is 15-tenths when cupped. It is possible there may be some objection to the construction of an additional lift in the way I adopted which I have overlooked.

Discussion.

Mr. Barret—The fact of Mr. Somerville having successfully done this work shows that it was well and properly done. An experience of that kind which I had some eight or nine years ago proved very unsuccessful and unprofitable. An old single-lift holder was extended in the same way, but owing to weak construction it proved so unsatisfactory that it was put out of use and a new holder constructed. I sympathize with a contractor who does this sort of work. It is assuming a great responsibility.

On motion of Mr. Howard a vote of thanks was passed to Mr. Somerville for his paper.

The President announced that the last regular paper on the list was contributed by Mr. J. C. Small, of Aurora, Ind. The author, however, had not been able, through stress of business, to attend the meeting. It was moved and carried that the paper be read, and the President asked Mr. F. H. Shelton to read it. Mr. Shelton then read the paper, which had for its title

A CENTRAL STATION ELECTRIC PLANT OPERATED BY A GAS ENGINE.

Our Secretary has assigned to me this subject and assures me that there is not another plant, to his knowledge, so operated by any member of the Western Gas Association. While my experience does not impress me as being especially interesting, yet, in view of the favors received at the hands of the gas fraternity generally, and the Western

Gas Association in particular, I could not in good conscience refuse to give the Association the benefit of my experience and to offer some suggestions on the subject.

Our Company, as well as others, has had its experience with manufacturers of electrical machinery and their representatives. So we have had with the public, who generally want what they have not, whether good or bad. For this and other reasons we had concluded that some one would build an electric light plant in our city, and that possibly it would be better for us to do it, and if so, we would operate it with a gas engine, a consumer, instead of with a steam engine, a competitor.

In the summer of 1890 the last applicant came into our field and asked our city council for a franchise to operate an electric light plant. We introduced an ordinance for the same purpose on the same evening, and both were granted a franchise. We at once prepared to install the plant we now have in operation. As electrical engineers appeared to believe a gas engine too unsteady to furnish power successfully for an electric dynamo, to make doubly sure, our order for the necessary machinery included a jack shaft 14 feet long and 4 inches in diameter, on the center of which was placed a 2,000 pound balance wheel, turned true and perfectly balanced. On one end of this shaft was placed a driving pulley and on the other end a clutch pulley, with the belt extending from the engine to the driving pulley and a belt from the clutch to the dynamo. This resulted in giving us an almost, if not absolutely, steady power.

We manufacture gas from what is known as second pool Pittsburg coal, and an average yield of 4¾ feet of gas to the pound. Nine hundred feet of this gas consumed in our engine per hour furnishes power for 60 $6\frac{8}{10}$ ampere, 45 volt arc lamps, over 12 miles of wire. Our engine gives us very little trouble, is in good condition, notwithstanding its 10 years' use, and looks as if it might do service for 20 years more. Our lamps are seldom dark, as the following extract from the last 3 years' report will show :

Lamps dark in 1897, 6 hours ; in 1898, 3 hours ; in 1899, 11 hours.

I have been running steam engines for 30 years and gas engines for 10 years, and in the light of this experience, were we installing power for any purpose, and especially in connection with a gas company, we would not for a moment think of accepting a steam engine free of cost instead of paying a fair price for a gas engine, and the larger either plant the more certain we should be of selecting the gas engine. We should do this for many reasons, the principal of which are economy and convenience.

I can see no reason for a gas company employing a steam engine ; in fact, it is an admission that gas engines cannot do the work. A gas engine can do any work a steam engine can do, and do it more conveniently and more economically. We run them all over town for all purposes. We have two engines, a 40 and 20, running machine shops, and each of them have in connection an incandescent dynamo, furnishing their own light. Of course we put them both in ; have been running 2 or 3 years, and give excellent satisfaction. Of course we had a lot of trouble early in our experience, but it was for want of *knowledge*, and if we had selected a man who was to run our plant, sent him to the shop where engines were being made and tested, and allowed him to remain there a month, it would have been money in our pocket ; and if any member who wishes to install a plant will send his man here and let him run our plant for two weeks or a month under the supervision of our man, they will have no trouble, and we will extend the invitation to *all* to do so.

The average gas consumer cannot be expected to give the subject of gas consumption the consideration necessary to determine the advantages of its use, and the gas company should do it and be able to demonstrate its advantages without the loss of time or expense to the consumer, and should have employes who could and would assist consumer in understanding its uses and advantages. This can best be done by the company taking its own medicine.

There can certainly be no doubt of the advantage to the average gas consumer of the use of the gas engine, the range, the water heater and the incandescent gas lamp, where a good quality of gas is furnished at a fair price, both of which the public have a right to expect ; and it is certainly largely to the interest of the company to meet this demand. And where it is cheerfully and faithfully done it results in the acquisition of friends by the company and a corresponding loss to the prince of all humbugs—Municipal Ownership.

Discussion.

The President—This interesting paper is on a subject which, according to Mr. Small, is neglected by a good many gas companies. Does any member desire to make any remarks ?

Mr. Fitzgerald—Gas companies often have to use steam for so many other purposes that it is often a waste to employ any other power. Of course, where there is no great amount of steam required there are many things, like the running of exhausters or scrubbers, etc., done around a gas works that can be done cheaper by a gas engine than by a steam engine, if steam is not required for other purposes.

The President—We have received several letters on this subject of gas engines, some of which refer to gas engines running large plants. Unfortunately the letters deal with engines not operated by illuminating gas. However, the Secretary will read the letters since they all contain interesting details referring to the matter under discussion.

The Secretary read the following letters—the first of which was from Mr. J. M. Rusby, referring to the gas engine plant of the Erie Railroad:

MAY 6th, 1900.

Mr. William McDonald, President, Albany, N. Y.: My Dear Sir—I owe you an apology for my failure to earlier furnish you data concerning the gas engine plant at the Erie Railroad. One reason for this delay is that I hoped to be able to collect some data concerning *efficiency* of the plant, and have rather waited for an opportunity to do so. I have been extremely busy, however, and have been unable to accomplish this and can send you only an outline description. This is about as follows :

Number of Engines, Size, Etc.—Two, of about 90 horse power each ; 3, of about 45 horse power each ; 1, of about 38 horse power ; 1, of about 19-horse power ; 1, of about 12 horse power, or a total of 8 engines of an aggregate horse power of 384. These engines furnish power for the following : Electric lights for the station and yard, compressing Pintsch gas, operating ash elevator and coal elevator for locomotives, operating a small machine shop, and operating air compressors for their signal system. The gas plant is not yet supplying power for this air compression, but arrangements are now being completed for this purpose. All engines are made by the Otto Company. The 90 horse power engines have two superimposed cylinders. All machinery is belt connected to the engines.

The speed of the 90 horse power engines is about 168 revolutions per minute. Engines have electric ignition. The large ones are started by pumping an explosive mixture by hand into the cylinders and then firing.

Producer Plant.—Producer gas is used in the engines. The producers were built by Messrs. R. D Wood & Co., and have the Taylor grate. There are two producers, each of 7 ft. internal diameter and 15 feet height. Anthracite coal of small size (rice) is at present used as fuel. I am informed that the total depth of the fuel bed is about 6 feet. Air is supplied to the producers by a steam jet blower, which affords sufficient pressure to force the gas generated through the apparatus and into a small holder, whence it is distributed to the various engines, some of which are situated three or four hundred yards from the producer plant. Attached to the producers is a heater of the tubular type, through which is drawn the incoming air for blast and through which passes the producer gas directly on its way from the set ; regeneration to some extent is thus secured. A portion of the engines were, at the time of their installation, operated with city gas ; on changing to producer gas the gas inlet ports were enlarged and the degree of compression increased in order to somewhere near maintain the power with the poor gas.

The plant in general operates very satisfactorily, I am informed. I am unable to say anything definite in regard to its economy in regular operation. To determine this it would be necessary to make test of the entire producer and engine plant in order to ascertain power developed and material consumed. I judge, however, that it is pretty efficient.

Trusting that the above may be of some slight value to you, and much regretting that lack of time has prevented my going more deeply into details, I am, very truly, J. M. RUSBY, Engineer.

The second letter was from Mr. A. M. Jones, Superintendent of the Sisterville (West Va.) Electric Light and Power Company :

OFFICE OF THE SISTERVILLE ELECTRIC LIGHT AND POWER COMPANY, SISTERVILLE, W. VA, May 9th, 1900.

James W. Dunbar, Esq., Secretary, New Albany, Ind.: Dear Sir—I am in receipt of your favor of the 25th ult., asking for information regarding the operation of a central station electrical plant with a gas engine. In reply, would say that we have one 125-horse power 3 cylinder Westinghouse gas engine, operating a 90 K. W. Westinghouse A. C. generator. We also have two 2-cylinder Otto gas engines of 110-horsepower each. These two engines operate a 120 K. W. Westinghouse A. C. generator with a countershaft.

We find the gas engine a satisfactory power, both as regards regula-

tion and cost of operation. Our Westinghouse engine has a regulation of less than 1 per cent. from one-fourth to full load. We have also pulled as high as 80 amperes with our Westinghouse engine, which shows that it will stand a considerable overload. Our Otto engines will pull 65 amperes each; also, the line shaft, while we are running one engine at a time. Of course, they would develop more power when both were running, which we can have them do, if necessary. These Otto engines have a regulation within 2 per cent. from one-third to full load. The cost of operating a gas engine is very much less than that of a steam engine.

We sell our current at 6 cents per 1,000 watt hours. During the month of April our plant earned $825; our gas bill was $63. The water used to keep the cylinders cool does not enter into any extra cost, as we have wells in the plant that are operated from our line shafts, and the cost of power for pumping the wells is included in the gas bill of $63. We find the cost for repairs on our engines very small. Our Westinghouse engine has been in constant use for 18 months. The expense on this engine has been $40; which amount includes a new set of exhaust valves just put in, and new platinum for the igniters. Barring the expense of an accident which happened to one of our Otto engines about a year ago, the expense for repairs has been very small. We would consider a gas engine such as we have a very good engine for operating a street car plant, as we can throw on from 200 to 400 lights without making more than 2 per cent. fluctuation in the voltage. We use natural gas, 1 cubic foot of which equals 966 heat units. This costs us 13½ cents per 1,000 cubic feet.

We find it impossible for any member of our company to be present at the meeting of the Association to be held in Chicago, but would be very much pleased to receive a copy of the proceedings. Hoping that the information above given may be of interest to those contemplating the installation of gas engines for electric light and power, we beg to remain, Yours very truly,

SISTERSVILLE ELECTRIC LIGHT & POWER CO.

The third letter was from Mr. William Wallace, of Lafayette, Ind.:

Mr. President and Gentlemen of the Western Gas Association: I have been very much interested in the subject of gas engines for central electric lighting plants, and wish to congratulate Mr. Small upon his success and good fortune in selecting and managing his plant so successfully. I feel, as Mr. Small does, that gas companies should encourage the use of gas engines, and have been watching the development of engines of large size, hoping that they would be a success and that they would take the place of the steam plant in our works, of which we have 700-horse power. About 2½ years ago an electric plant was established here, consisting of two alternating dynamos and a rotary transformer with all necessary instruments and apparatus. This plant is operated by two 125-horse power gas engines, and is so situated that I can observe its operation at any time. The item of gas to operate this plant is very small, as natural gas is furnished to it at 7 cents per 1,000 feet, the water bill to cool the cylinders in summer months being almost double the cost of the gas to operate the engines. One of these engines is used to operate lights, and carries from 300 to 1,400 16-candle power lamps; the second engine is used to operate power, and furnishes an average of 25-horse power to motors. After these engines were installed and operated about 12 months they gradually lost their power; and so great was the loss that it required almost the combined power of both to do the work of one. Within a year from the time the engines were started one of the main crank-shafts broke, then one or two of the cylinders, and I believe nearly all small gear were replaced. To keep these engines in condition to run has been a continual source of annoyance and bill of expense to the company operating them. The condition of these engines became such that one of them was sent to the shop, and has been returned with a complete new set of cylinders and many other improvements; the second engine is now on its way to have similar repairs made upon it. Last summer the company operating these engines installed a 150-horse power steam engine, ostensibly to be used when the natural gas should fail, and it seems to have been very convenient to use it when the gas engine failed to operate.

It is to be regretted that these engines have not been more successful, and I do not think there is a member of this Association who would not hail with pleasure a gas engine of large power that could be relied upon to operate an electric plant in connection with his gas works. My observations of gas engines operating a central station have been limited to these two engines, and it may be that other plants are being as successfully operated as the one by Mr. Small. If there are such I hope the gentlemen present will give us what information they have on the subject. Respectfully, WILLIAM WALLACE.

Mr. Paullin—In Leavenworth, Kas., we have several small gas engines. The largest is of 15 horse power, and it has been running for 12 years with hardly any repairs. Others that have run for several years have required very few repairs. The engines are run on water gas, and are run successfully.

Mr. Egner—It was interesting to me to hear that good report about the satisfactory action of the gas engines as stated in the first two letters read. Eight years ago I spent a good deal of money in advertising that I would put in gas engines and producers that would furnish power at less than one pound of coal per horse power, but with no takers. Of late I see that gas engines are forging ahead. I fully believe they are to be the power of the future, not for special purposes alone, but for general purposes. It affords me a great deal of gratification to hear this matter referred to so favorably at this time. This morning I had some conversation with Mr. Wallace, the writer of the last letter read. He said that the water in his place was so heavily charged with lime that a scale was formed, and that the water jackets around the cylinders soon became filled. It appeared also that the cylinders were burned and had to be sent to the shop to be repaired. Naturally, the scale being a very poor conductor of heat, it will prevent the water cooling the cylinders, and the result happens which we know must occur. It might be a good wrinkle for someone to invent a water jacket for gas engines that can be removed. A fortune seems to be in that line for an inventor.

Mr. Howard—We put in 8 gas engines in Dubuque, Iowa, one of which has been running for 18 years without any repairs at all to speak of. Another in a daily newspaper office has been running for years, and I think the only expense for repairs thereon was the cost of 2 new gas bags. The only accident that occurred to any of the engines that caused expense followed advice given to the engineer to use castor oil on the engine—it was an old slide-valve engine of the Otto make. The oil got heated and cut the valve. On examining it, I found the valve cut considerably, and asked the engineer what kind of oil he had been using. He said castor oil. That of course solved the problem. I had the valve taken out, planed, scraped and put back again. I told him to use proper oil, and the engine is running yet. I am satisfied that, for intermittent power especially, no other engine equals the gas engine. This is not the day to speak about the successful working of gas engines. The matter is beyond experiment when you come to realize all that is being done by them. In the city of Belfast, Ireland, the whole electric plant is run by several gas engines all the way from 50 to 150-horse power each. I am satisfied that the trouble sometimes reported with gas engines is traceable to the lack of common sense on the part of the "engineers" who operate the machines. There can no longer be any question about the utility of the gas engine. I am satisfied that where a person wants power, either for the electric light or any other power, it is the cheapest engine. For intermittent power especially nothing else can equal it.

Mr. Egner—People buying gas engines often make a mistake in the type of engine they purchase. A gas engine that will do well on natural gas will not do well on producer gas, and an engine adapted for producer gas will not do so well on coal or water gas. It should be known what kind of gas is to be used with the engine. The size of the exhaust pipes, gas pipes and of the valves should be determined by the kind of gas to be used. This must be considered if you would have a gas engine that will run properly and not cause trouble.

Mr. A. S. Miller—Within the last year I have discarded and practically thrown away 5 steam engines. I do not think though that this fact is anything against steam engines. The case in point, of the gentleman who had ruined or found after a few years' work that two gas engines were not satisfactory, I do not think is anything against the gas engine. The trouble with the steam engines was that they were not designed properly; three of the five were not originally designed properly, and were not worth anything for any kind of work. They had been in use for only three years, but it was cheaper to throw them away than it was to keep them running. The other two engines had been in use for four or five years. The difficulty with them was that conditions had changed, and they were not designed for the work in hand. So I imagine the gas engines referred to were not designed for the work in hand, or else were not designed for any satisfactory work. They may not have been properly taken care of.

Mr. W. E. Steinwedell—I did not hear the paper read, but I have made a few notes on the use of gas engines for driving central station dynamos. I had the pleasure of being for one year at the next oldest electrical station in Europe, at Dessau, where there were two 120 horse power gas engines of two cylinders each. They were direct connected to 110 volt, direct current dynamos. They used cooling towers for

water to cool the cylinders and a storage battery to help out at the peak of the load. The advantages claimed and found were: The small space necessary for a plant of this kind; the small amount of water necessary to generate a certain amount of electricity—equal to about 25 quarts per horse power per hour; and the fact that there being no railroad switch necessary enabled the plant to be located wherever you chose. There is no smoke nuisance, no danger of explosion, and the first cost is less, as it requires less ground space, and less cost for copper by reason of the fact that you can locate the station right in the center of distribution. The less cost also arises from the fact that gas motors are cheaper than a boiler house, boilers, stacks, pumps, etc., and there are also less line losses and a smaller pay roll. The fact that in using gas engines for central stations enables you to measure the gas very carefully with the meter, and to start up an extra engine at very short notice without firing additional boilers, renders a gas plant very much more flexible than a steam plant would be. Another advantage is that with the exact results obtainable by the use of meters for the gas consumed one can see that it takes so many feet of gas to make so many watt hours of current and enables you to put a very close price on your electric current because of the fact that you know just what it costs you. One lamp hour of 55 watts required 3½ cubic feet of coal gas. In conclusion, all these results are now four years old and have undoubtedly been improved upon since that time.

Mr. Norris—Did Mr. Egner say that the reason those engines failed was because scales from the cooling water formed in the jackets, and so destroyed the cooling effect of the latter? If that was so, it was not the fault of the engine, but rather the fault of the water used for cooling purposes. And that is nothing against the gas engine.

Mr. Egner—Mr. Wallace said that the water being so charged with lime formed such heavy deposits that it closed the jackets. As Mr. Norris puts it, it was not the fault of the engine or of the man who built the engine, but of the water that was used. The cylinders not being cooled properly naturally burned up. It was caused by a little lack of information on the part of the builders of that plant. That is the point that I endeavored to bring out.

Mr. Britton—Mr. Small figures out he was consuming about 20 feet of coal gas per kilowatt. Has any member present had any experience in operating gas engines of over 100 horse power on water gas, and what the results were. What the consumption was per kilowatt per horse power?

Mr. Egner—I have had no experience in that respect, but I have information that engines are now built that do not consume more than 15 cubic feet per horse power of water gas. They are built not so very many hundred miles from here, but I will not mention any names. That is the actual quantity of gas used per brake horse power.

Mr. Doherty—I am interested in this subject, although I did not hear the paper of Mr. Small read, nor have I heard all the discussion. We have one engine of 280-horse power run on water gas. I cannot give the exact consumption per kilowatt. The engine was really built for natural gas, which has a very low flame temperature. We had some trouble with it, and it is only in the last few weeks that it has been working well. It is installed at Long Branch, N. J. Mr. Strong, the Manager, was too busy to come to this meeting. I would not care to give any figures, except to say that I think it is going to be a pronounced success. At some future convention Mr. Strong can probably give you the data concerning that gas engine. Mr. * * * gave me the result of the operation of an engine at F. * * *, and the figures were very satisfactory indeed. The consumption was not excessive, but I do not think it ran as low as 20 feet per kilowatt hour. Mr. Egner's reference to engines running on 15 cubic feet per kilowatt hour were probably obtained from some of the results of the Diesel motor. I believe there are several of this type of engines working in this country, two of which are running in a large brewery in St. Louis. I do not think they have ever built engines of this type above 30 horse power. Theoretically it is the most effective of any type of engine; practically it has been hard to Americanize. It is too complicated in the form in which it was received in this country and is not adapted to our methods. There is no longer any question but that a given quantity of power can be obtained cheaper by a given consumption of fuel in the form of gas than in any other way. The load curve of the average central station, and especially in the smaller Western towns, is not adapted to the use of high economy engines. When we get the compound condensing engine it is about as far as it is practical to go. Engines of this type and of small size are not particularly economical. There seems to be a prejudice in the engineering profession against gas engines. I do not know why it is so, but there is certainly a prejudice which is noticeable at every scientific gathering except that of gas men, and often shows itself even at gas conventions. In the last two years this sentiment has materially changed. One large manufacturing company, which has been successful in other lines, has taken up the manufacture of gas engines seriously, and is building a large size engine. The company intends to make a go of it. It has a well equipped shop, and means to take care of the engines after they are out. Other companies are springing up which expect to go into the gas engine business on a large scale. Heretofore the gas engine business has been confined to very small shops, the operators of which could not afford to do any large amount of experimental work, and there must be a large amount of experimental work before gas engines can be made useful for heavy work. As a general rule the cost of firing the boilers of a central station is about one-third of a cent per kilowatt hour. The fuel consumption with coal at $2 per ton need not exceed .6 of a cent per kilowatt hour. So that the boiler firing often represents 33⅓ per cent. of the cost of the steam at the outlet of the boiler. Of course that one third of a cent for firing is entirely eliminated when gas is used for fuel purposes. I have studied this subject considerably and am sorry I am not in a better shape to discuss the subject. Gas engines are the coming thing, and I think their great competitor is the steam turbine, and not the steam engine.

Mr. Egner—I am inclined to think the engine I meant is the one he is talking about. I did not mean the Diesel motor, but that is a very good machine all the same.

Mr. Howard—I think the greatest competitor the gas engine has at the present day is the gasoline engine. Has any member had experience with the gasoline engine, with respect to the cost of running, as compared with gas?

Mr. Highlands—I think I can answer that question. I ran a gasoline engine last year, and I had more pleasure and more satisfaction out of its operation than with any engine I have ever had to do with in my life, and I have been connected with steam engines to a pretty large extent for 15 or 20 years. If Mr. Howard or any other of the members of the Association will come to Clinton, Mo., I can promise them a great deal of pleasure, if they are fond of fishing. We have very fine black bass fishing, and there is more pleasure in catching fish than there is in riding in my boat, but the engine will push you along just the same. As to the cost of operating the gasoline engine in my boat, I cannot make any estimate, because I charge it all to pleasure account and get full value received. I would be glad to have you all come there at some time and give it a trial. There is no danger of the boat upsetting. It has a double hull, which can be pumped full of water without sinking. I can go along the river in a storm when other boats tie up. If any of you doubt it come and try a trip with me.

Mr. Chollar—Replying to the statement about the gasoline engine being the greatest competitor of the gas engine, I may state that in the last 6 weeks in St. Louis we have changed half a dozen engines from gasoline to gas, and we find gas much more preferable.

The President—The gasoline engine is a serious competitor for the gas engine beyond the line of gas mains.

On motion a vote of thanks to Mr. Small for his paper was adopted, and the President personally thanked Mr. Shelton for having read it.

In the Matter of a National Bureau of Advertising.

Mr. Doherty—I am commissioned by the Ohio Gas Light Association to say that at its last meeting it was proposed to appoint a committee of one to confer with other Associations with regard to the establishment of a National Bureau of Advertising. Intending to come here prepared to convince members of this Association that such a bureau would be highly desirable, owing to lack of time I have not prepared myself; but it seems to me that argument favoring a bureau of advertising is almost unnecessary. The only objection to it is that some one must foot the bill. Any move of this sort requires the united efforts of every body interested in its success. It is a very easy matter for one or two men to appear on the negative side and carry more weight than a great many men on the affirmative side. At the meeting of the Ohio Association we gave this question probably more consideration than this body can afford to give it, especially taking it up at this late hour. At our first session there was pronounced opposition to the scheme. We discussed it pro and con, and finally took it into executive session and discussed it there. The result was a unanimous vote in favor of appoiting a committee to confer with other Associations in the hope that a National Bureau of Advertising could be established. It was my misfortune during the past winter to be the Manager of a gas company in a city of about 175,000 inhabitants, in which no fewer than 72 publications were printed. If we advertised in any one of these we had to advertise in all. As the advertising rates would not permit us

to advertise in all, we advertised in none. Another company, of which I had been Manager, spends several thousand dollars each year in advertising. In spite of that fact our customers seemed to fail to see our advertisments, although they sometimes took up about half a page of the newspaper; but they frequently brought us in advertisments of a certain stove company in the *Ladies Home Journal*, or other magazines of that type. I did not keep track of those applications, but they were numerous enough to convince me that local newspaper advertising does not fully cover the ground. I do not want to be misunderstood. I think local newspaper advertising is a most effective and a wise way of spending one's money; but advertising cannot be effectively done in one manner only; advertisements must be distributed. Many of us use newspaper advertising, posters, and personal solicitation; but I think we would all be better off if we had another channel, and advertised in the national magazines. If half the gas companies of the United States would subscribe to a National Bureau of Advertising, it is surprising what a magnificent fund small assessments would make. It would have other advantages to the local companies, as the advertising in these journals would probably be done by experts in their line, and would help any other local advertisement. In fact, so many other advantages are apparent that I hardly think it necessary to take your time to tell you all about them, if you have not already thought of them. I believe, after having considered the question for more than a year, and after having discussed it with a great many of the prominent gas men of the country, that the plan can be successfully carried out. And especially so if it be not jumped on in its infancy. It has not much strength yet; a little later it will be better able to fight its own battle. I move that this Association appoint a committee of one to confer with committees of other Associations, to decide on the feasibility of establishing a National Bureau of Advertising, and to be prepared to present facts and figures to the officers of this Association from time to time; and that they report at our next meeting—provided satisfactory arrangements cannot be made before that for the establishment of such a Bureau. There will be no subscriptions which will be compulsory. They will be voluntary. In view of the magnificent subscriptions obtained for the Educational Fund (at the start of which many men said that it could not be carried through) I think we can well afford to give this our support.

The motion was seconded by Mr. Diall.

Mr. Roper—This is the first time I have had the opportunity to get on my feet to say something as an active associate member—more associate than otherwise. I happened to be at the meeting in Columbus when Mr. Doherty first brought up this subject. It was new to me, and I will admit that I took a fancy to it. Since then I have talked with a number of people in other lines of business and I have come to the conclusion that the gas people, as a fraternity, do more for nothing and give away more and are doubted in their statements more than men in any other line of business. When you say you will do a thing at less than cost, they put you up against Sol. Wolf, or some other old Jew clothier. I have had the pleasure of talking with several of those people. They hire a man for advertising purposes exclusively, and that is his whole business. One of the most successful advertisers in the city of Chicago told me that if one scheme in 12 was successful it paid; but the man had to keep thinking all the time in order to get up the 12 schemes so as to get one successful one. Now, the average gas man, and some of the supply men who are looking after the other end of the business, cannot devote his time to writing "ads." And he doesn't know how. It is out of his line. I do not believe any scheme has ever been started or suggested by gas men which will pay better than this. If you talk with the successful advertisers, such as the people at "The Fair," or with Marshall Field, or with others who have been very successful in their advertising—these people who said a few years ago that they would not advertise "Bargain Mondays," but found out that they had to advertise "Bargain Mondays," or they would not get the trade and that the other people did—you will find that the best stores and the best people in Chicago are to-day advertising bargains on Monday. They have been forced into it. If you will study the subject systematically, and talk with advertising men in any line—I do not care what it is—you will find they will say that one man devoting his exclusive time to the thinking up of schemes to make gas, or any other thing, popular can do more than 500 men who devote 99 per cent. of their time to something else, then go to bed, dream of something, and get up and say they will try it. Now, as an associate member, as a supply man, I would be willing to subscribe to and pay more into a bureau of this kind than I ever paid in any year in the history of our company for all the advertising we have ever done. And I believe it would be successful.

The motion of Mr. Doherty was adopted, and the President stated that he would name the member of the committee later.

Report from the Committee on Cyanides.

Mr. E. E. Eysenbach read the following report from the Committee on Cyanides, which was, on motion of Mr. Egner, received and the Committee discharged with the thanks of the Association.

The principal demand for cyanides comes from the gold fields. All the other trades absorb but a very limited amount. A white salt (98 per cent. pure KCN) is necessary for gold extraction. To obtain this from crude gases is a roundabout process. The impure yellow prussiate is obtained from crude gases (blast furnace or from gas works), from the destructive distillation of the nitrogenous residues of sugar refineries (practiced in Germany), and other nitrogenous material. The cheapest source is the waste cyanogen of crude gases. Gas companies can treat either the spent oxide, which retains a large percentage of the cyanogen of the gas, or they can absorb it directly from the gas by a mixture of ferrous hydrate and an alkali. In either case the prussiate is first obtained and then used for the production of KCN. To obtain a high grade of KCN brings up the cost of production, and many attempts are being made to produce it synthetically. A large number of patents have been taken out. An electric process in Scotland claims to be able to produce it now for less than 10 cents a pound. This would prohibit its further manufacture in the old way.

The United States Bureau of Statistics gives, in its 1899 report, the imports for the year of potassium cyanide and yellow prussiate as follows:

	Weight, Lbs.	Value.	Duty. Pr. Ct.
Potassium cyanide..... ...	22,400	$4,109	25
" "	527,297	116,143	12½
Yellow prussiate.....	251,000	26,377	25
" " 1,088,000		106,131	40

This makes the potassium cyanide worth about 20 cents per pound, and the yellow prussiate 10 cents per pound, which value does not include the duty. The quotations at New York for these products for the last year average 28 cents per pound for potassium cyanide and 19 cents for yellow prussiate. This leaves a wide margin, and no doubt the pioneers in this country in the recovery of cyanides get a good profit on their investment. One firm in Cincinnati, O., is recovering successfully the cyanides from spent oxide, and another firm is starting up at Syracuse, N. Y. Their processes are secrets (better than patents) and are carefully guarded.

In this country the gold fields will absorb a continually increasing amount of potassium cyanide, but as yet the consumption is very limited, and if all the gas companies should at once undertake the recovery of cyanogen it would be a drug on the market.

Henry L. Doherty, Chairman.

READING THE WRINKLES.

The President—We will now listen to the reading of the Wrinkles, collected and edited by Mr. F. H. Shelton.

Mr. Shelton—Before reading them I want to tender my thanks to those members who have responded to my request. I have endeavored to do so in each instance by letter, but in the event of my having neglected to thank each and every one, I want to go on record now as doing so, because I highly appreciate your willing co-operation and assistance. I also want you to bear in mind that the function of the Wrinkle Editor is largely that of a receptacle—possibly a receptacle with holes, a filter. I simply receive that which comes in and put it in convenient shape for presentation here, and should have neither credit nor discredit as regards the merit of what is received.

1. *Device for Floating Hydrometer.*—Mr. W. E Steinwedell, of Belleville, Ills., contributes a very convenient device for readily observing the strength of ammonia liquor where such is saved from the scrubbing apparatus of a coal gas plant. The body *P*, shown in section in the cut, is made of cast iron. Into it on the under side is made a short piece of 2 inch pipe, threaded at the bottom for connection with the overflow pipe of, say, a standard washer scrubber. On the top of the body rests a glass globe *S*. The ammonia liquor flows into the tube *A*, up through it and over the top at *B*, and passes on out through a connection at *C*. The hydrometer floats in the 2 inch middle tube, and the strength of the liquor can be read through the glass at a glance.

2. *Gas Works Thermometer.*—The ordinary thermometer supplied by the trade for taking temperature in gas works costs several dollars, and the expense of such has, without doubt, acted to restrain the desirable observation of temperatures, especially in small works. Mr.

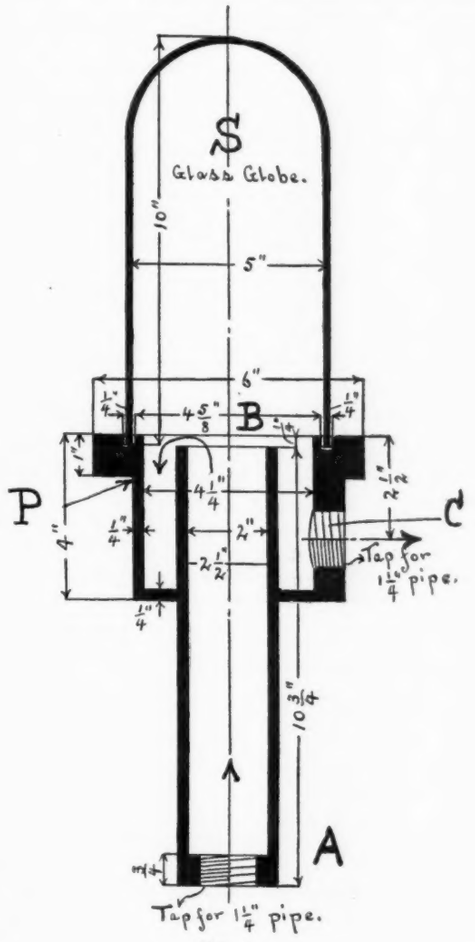


Fig. 1

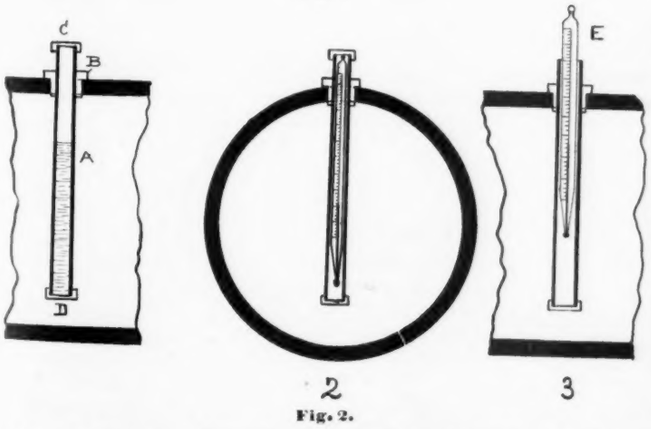


Fig. 2.

James W. Dunbar offers a simple, effective, readily handled and cheap homemade substitute.

In the gas pipe where the temperature is to be observed, an inch hole is tapped on the top, into which is inserted a 1 x ½ inch bushing, *B*, with the half-inch thread run clear through. A half-inch pipe, *A*, with cap, *D*, on the lower end, and a thread 2 inches long on the upper end, is made into this bushing in such a way that it projects through at the top an inch or so. This pipe, *A*, is filled two thirds full of water and the thermometer, *E*, is placed in it, being held down by the cap, *C*. When the cap is removed to make a reading, the thermometer immediately floats up and is readily taken out for reading the temperature. A small 25 cent dairy thermometer answers the purpose very well.

Referring to this Wrinkle, Editor Shelton said : I do not think it ordinarily fitting to utter praise or criticise any of the wrinkles, yet I do want to call attention to this wrinkle, as being my idea of a most practical example of a perfect wrinkle. It describes a cheap, effective and satisfactory device. It does the work ; it saves to a very high degree the cost of the regular device for doing the work ; it enables reaching a field that is not ordinarily reached in taking temperature, and is exactly the character of practical wrinkle that the Association is looking for. As a correct type of wrinkle I think Mr. Dunbar's entry is entitled to 100 per cent. of praise.

3. *Temporary Street Main Relief Drip.*—Mr. James W. Dunbar points out that occasionally, during winter months, a break in a street main or service pipe will let in large quantities of water, requiring the services of a man to pump drips at frequent intervals, the frozen ground preventing the immediate location and repair of the break. Where strata of sand and gravel, or other porous soil, underlay the pipe, a

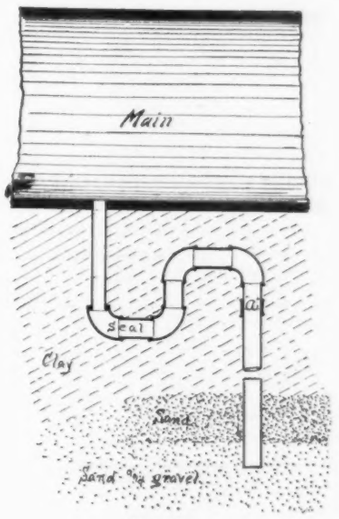


Fig. 3.

drip can be arranged to draw off the water as fast as it accumulates. With a 3 inch posthole auger, a hole 20 feet deep or so can be bored in a short time, and if gravel and sand are found, a pipe may be dropped down the hole until the bottom is reached and its top connected by a siphon seal to the bottom of the main, as shown in the cut, in such a way that the water will run off as fast as it collects, while yet sealing off the escape of gas.

4. *Meter Connection Tools.*—Mr. B. W. Perkins, of South Bend, Ind., describes a handy set of tools used by his Company for making side-outlet meter connections with uniformity and economy. The tools proper are Nos. 7, 8, 9 and 10 in the cut. No. 10 is a malleable tee, bored and fitted with a taper shank to go into the tail stock of a lathe. The cutter, No. 7, is made of gas pipe with filed teeth. To make a set of connections, the lead pipe is first sawed into a piece long enough for making two connections, as shown in No. 1, and is placed in a lathe, being held by a self-centering chuck. Tool No. 8 is put in the tool post of the lathe at a point opposite the center of the

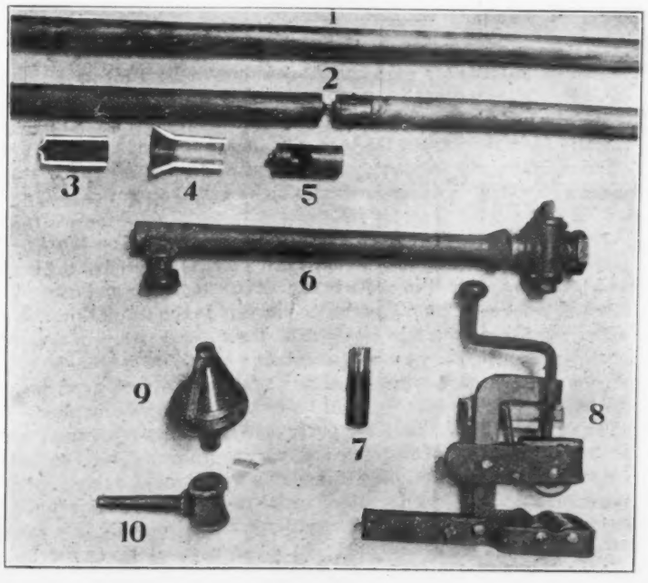


Fig. 4.

lead pipe, and upon the lathe being turned and the tool No. 8 being operated by revolving the crank, the lead pipe is gradually cut in half, but in such a way that the two ends are closed over with a thickness of lead equal to the thickness of the pipe. A half section of such an end of pipe is shown in No. 3. Tool No. 10 is then put into the tail stock of the lathe, the cutter No. 7 is put into the chuck and the end of one of the pieces, shown at No. 2, is put into the tool No. 10, and a hole for the union cut with No. 7 in the side of the lead pipe, with the result shown in No. 5. Tool No. 9 is then put into the chuck, and the open end of the lead pipe is flanged and spread out with it to receive cock or nipple, the resulting half section appearing as in No. 4. Three-sixteenth inch wire solder is coiled on pipe of the right size and cut into rings, which are slipped over the union and cock before inserting into pipe and soldered in the usual manner. No. 6 shows the finished connection.

5. *Meter Number.*—Mr. F. H. Parker, of Burlington, Vt., although not a member of this Association, kindly contributes a suggestion as to the numbering of the meters. With a set of ordinary stencil dies he stamps out the required figures in a piece of thin spring brass, say of .035 gauge, and attaches the numbered pieces so made to the front of

Fig. 5.

each meter by a drop of solder through holes at each end. The paint of the meter shows through the holes where the figures are cut out, so that the number is read at a glance, and is less likely to become obscured than where it is simply painted on a meter and soon becomes covered with dust.

6. *Cleaning Meters.*—Mr. S. G. Glass, of Milwaukee, Wis., points out that by the use of a power brush machine more or less on the order of that illustrated herewith, the Milwaukee Company is able to clean with one man 10 times as many meters in a day as was the case when such work was done by hand. The machine is one of the many sup

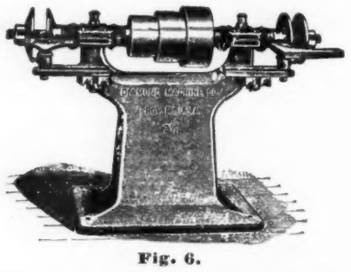


Fig. 6.

plied by the trade for grinding, burnishing and polishing purposes, etc. Mr. Glass writes that the wire brushes used will be found to last best if the wires are set at a tangent, as when they are set straight, or radially from the center, there is a tendency to crystallize and break off in a short time. For companies of considerable size, such equipment undoubtedly greatly facilitates meter and shop work.

7. *Valve Controlling Device for Engine in Water Gas Works.*—In most water gas works while a run is being made the speed of the engine and blower is reduced in order to save steam and wear and tear. This is usually done by a cord or rod connected to the steam throttle, and extending to the operating platform of the water gas apparatus. The average gas maker is very apt to operate such a cord with a jerk, and to run steam on too abruptly, racking the engine severely and causing the belts to thrash violently and in a very objectionable manner. Mr. Francis Carroll, of the New Orleans (La.) Company, experiencing such difficulty, has constructed a very ingenious device, as herein shown, for entirely obviating it, and one which enables the starting of the engine at any speed desired or for which the mechanism may be adjusted. *A* is a small cylinder working within one slightly larger, *B*, guided by wheels, and being in effect a small tin or galvanized holder working in a tank. It is connected to a lever *H*, overhead,

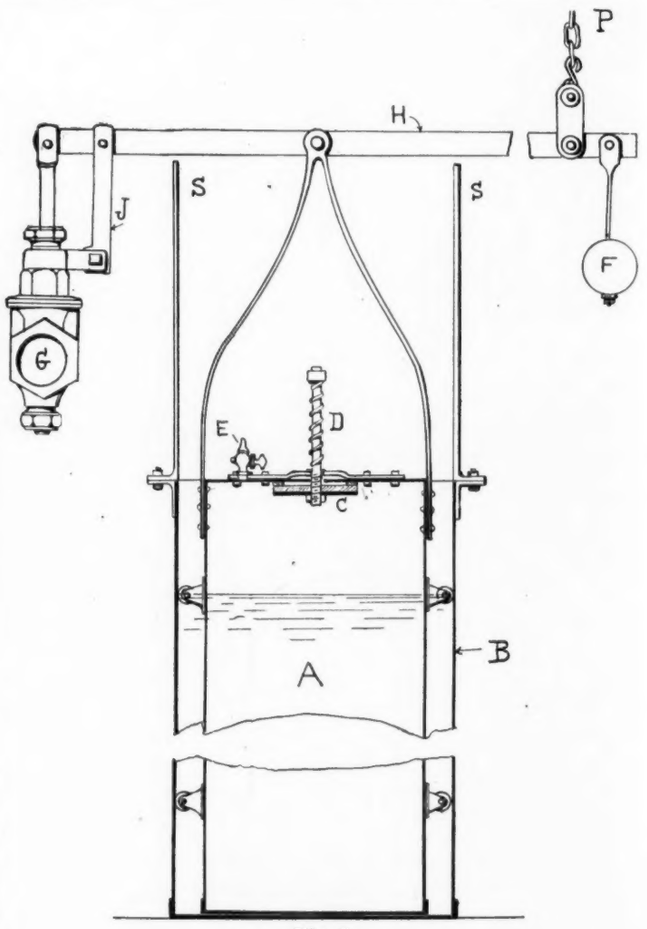


Fig. 7.

which lever in turn (carried on a fulcrum, *J*) is attached to and operates the steam valve *G*. On the top head of the drum or cylinder *A*, is a valve *C*. This valve is made of sheet iron, having an inner disk of sheet rubber, which seats (when the valve is closed) against a brass ring on the under side of the head of the cylinder. The spring *D*, on the stem of the valve is just strong enough to balance the weight of the valve and to keep it closed. On the head of the cylinder is also a small air cock *E*. On the end of the lever is a counter-balance weight *F*, near the chain or cord *P*, extending off to the water gas operating floor. *S*, *S*, are two fixed supports to take the weight or strain of the lever *H*, and mechanism from the valve *G*, when the lever is down. In operation at the end of a blow the lever *H*, is lifted up by the pull of the gasmaker on the chain *P*, and closing the throttle *G*, it at the same time lifts the cylinder *A*, out of the water several inches. This momentarily forming a vacum, the valve *C*, opens and the air flows in until the air pressure in the drum or cylinder *A*, is restored to the normal, when the valve *C*, closes. At the end of the run, when it is desired to open the throttle and speed up the engine, the chain *P*, is released and the counter balance *F*, pulls the lever *H*, down again to its original position, but the return of the cylinder *A* is slow and gradual, because of the compression of the air within it and the air cushion thus formed between the surface of the water and the head of the cylinder. The adjustable cock *E*, however, being slightly open, the air gradually escapes through it until the cylinder has settled down and into the position that leaves the throttle wide open. This is done in such a manner that the movement of the lever *H*, is perfectly easy and gradual, and the re admission of steam to the engine is entirely free from abruptness. The entire mechanism can be conveniently located on a shelf attached to the wall at a point near the steam throttle.

8. *Charging Buggies for Water Gas Generators.*—Mr. Francis Carroll, of New Orleans, also sends two Wrinkles of easy and convenient application in those water gas plants wherein the fuel is brought to the upper platform by a conical buggy, and wherein trouble is at times experienced in making the fuel run out easily, as well as in locating the buggy exactly over the center of the charging door. By cutting a

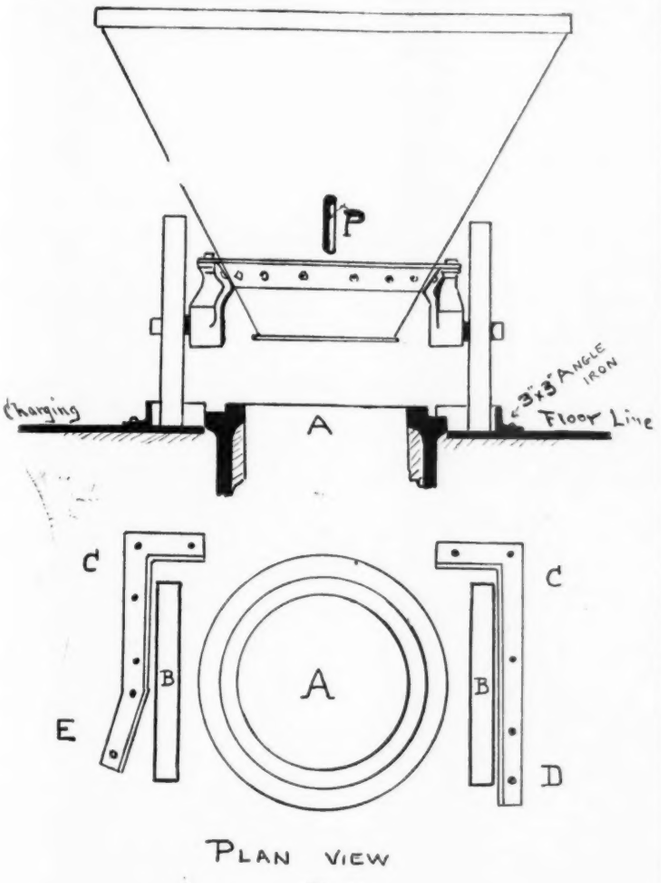


Fig. 8.

hole *P* (about 1 inch wide and 4 inches high), near the bottom of the buggy, a small bar can be poked in to start the coke and make it run out, when, as is often the case in the use of large lumps, it arches and does not move. The usual practice in such event of thumping the buggy with a bar or sledge to make the fuel run is not conducive to long life of the iron. On either side of the charging door *A*, Mr. Carroll arranges two pieces *C*, *C*, of 3-inch angle iron, bent as shown and fastened to the floor. These are so distanced and placed that when the wheels of the buggy are run between them, until they hit and stop, the buggy itself is found to be directly over the center of the generator and in exactly the right position for discharge. One end of the iron *E*, is turned out a little in order to make the entrance of the buggy between these floor guides easier, and without binding or the need of exact ob servation on the part of the gasmaker.

9. *Generator Charging Bucket.*—The usual bucket for charging water gas generators has a cone at the bottom for preventing the escape of the fuel until the proper moment. This cone is not always entirely satisfactory, as it requires space for its vertical movement and frequently does not work as smoothly as should be. The forms of bucket in which a hinged door is used, as well as the cone form, make it impossible to put the bucket immediately on the generator door and involves the spilling of considerable fuel. The sliding door form is hard to open, and necessarily cuts the bottom nearly off the bucket.

Mr. Donald McDonald, of Louisville, Ky., calls attention to a form of bucket used by him in which the fuel is retained by a simple grating until ready for discharging, when it is drawn out. This grating he makes of gas pipe and fittings, the pipes having sharpened plugs of iron in the end. Its use he states is in every way satisfactory. Mr. McDonald does not state whether the grating is pulled out by hand, or whether a lever or other device is used. In the cut *A* is shown such a lever as would readily operate the grate. In the cut *B* are shown the holes in which it works, and *C* shows the grate proper.

10. *Steam Supply of Water Gas Apparatus* —Mr. C. C. Hartpence, of the New Amsterdam (New York) Gas Company, contributes an arrangement used by him to give a simple, convenient and positive control over the steam supply to water gas generators. The illustration

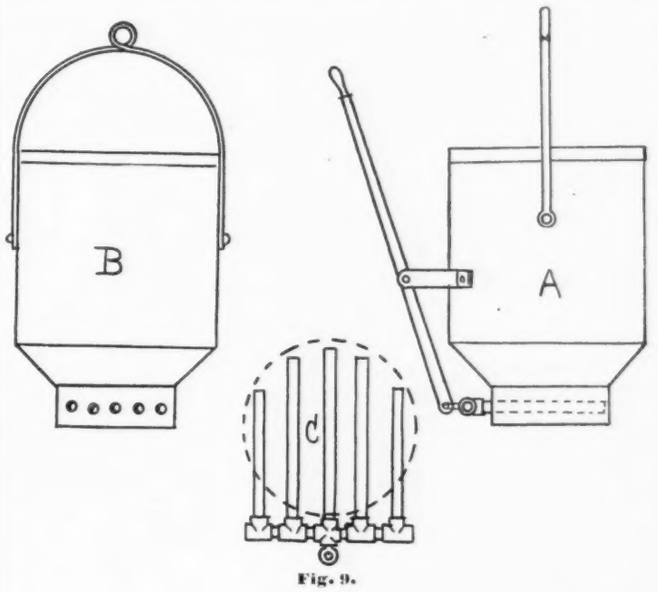


Fig. 9.

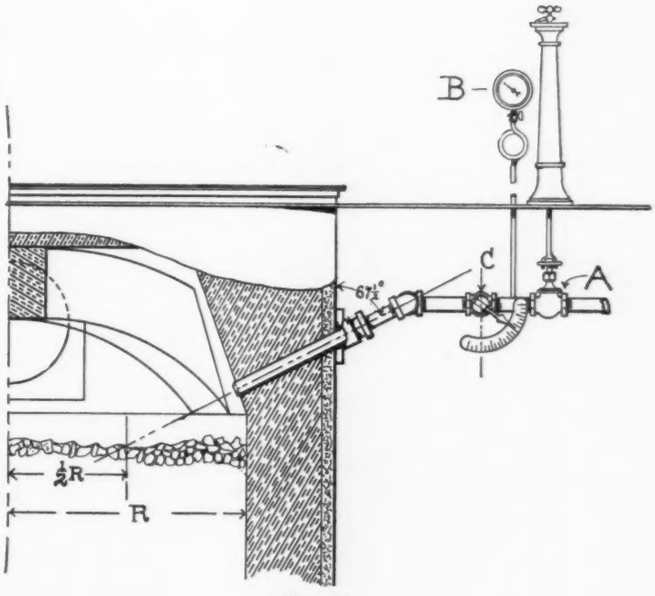


Fig. 10.

shows the connections as applied to a Lowe machine, making down runs. The full steam pressure is carried up to the throttle valve *A*. After passing through this valve, the steam pressure is communicated to a gauge *B*, placed in any convenient place on operating floor. Beyond the gauge in the steam line is placed a cock *C*, which may be kept open at any desired point. To it a pointer is affixed in connection with a suitable scale, so that after it has been determined to what degree the cock *C* should be opened, it can be quickly set or reset at such point at any time. With the above arrangement, after it is found that a certain opening of the steam cock and a certain inlet steam pressure give the best results, there is no difficulty in duplicating these conditions for each run, as the gasmaker has but to open the throttle *A*, until the desired pressure is shown on the gauge *B*.

11. *Improved Body for Chandelier.*—Mr. Jas. Ferrier, of Columbus, Ga., calls attention to the difficulty frequently experienced in cleaning old gas chandeliers, especially where the same are of combination form and fitted with electric wires. He suggests that if the usual body *A* (into which on the under side a stem or rod is usually screwed for supporting the customary ornament), was made with a hole at the bottom extending into the chamber of the casting, and that if in such a plug was used that could be readily removed, it would be comparatively easy at any time to unscrew the stem and plug *B*, and insert a wire for cleaning the fixture.

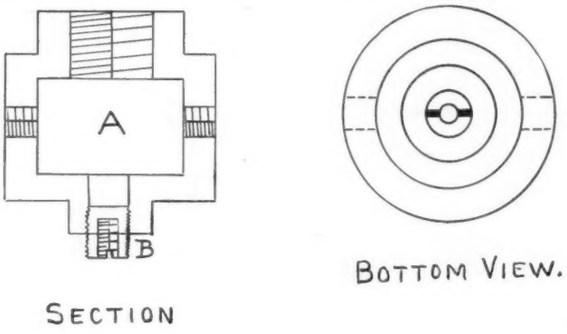


Fig. 11.

12. *Weather Boarding for Gasholders.*—Mr. Paul Doty, of Grand Rapids, Mich., describes an arrangement used by him to prevent a repetition of trouble in gasholders from anchor ice, etc, Around the walk of a steel tank are placed at suitable distances wrought iron forged hangers *A*, *A*, *A*. These hangers carry the boards *B*, *B*, which are cut and fitted to within 2 inches of the outer section of the holder. The 2-inch space is filled in with a strip of 3 16 sheet rubber, the whole making practically a large size "weather strip," working against the holder all around. The result is that snow shovelled off the crown does not drop into the tank, radiation of the heat from the steam pipe near the surface of the water is greatly diminished, less steam is necessary for heating the holder and much less trouble or apprehension is involved in looking after it.

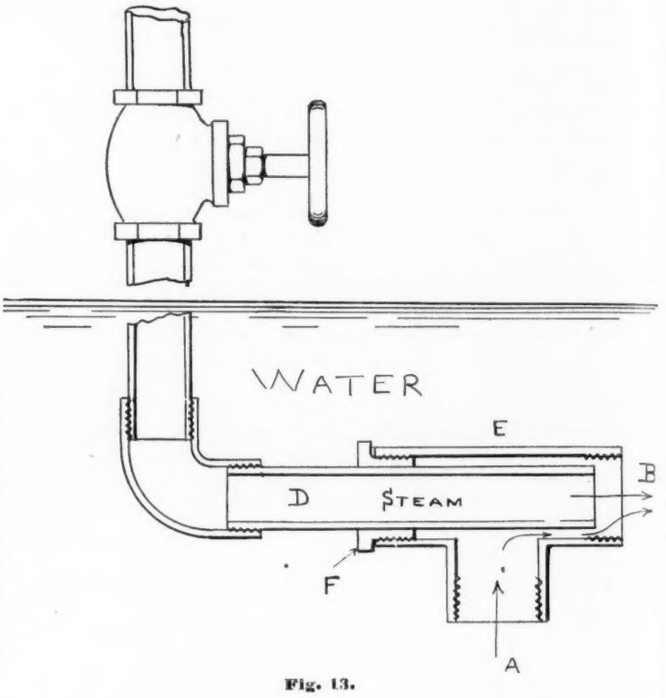


Fig. 13.

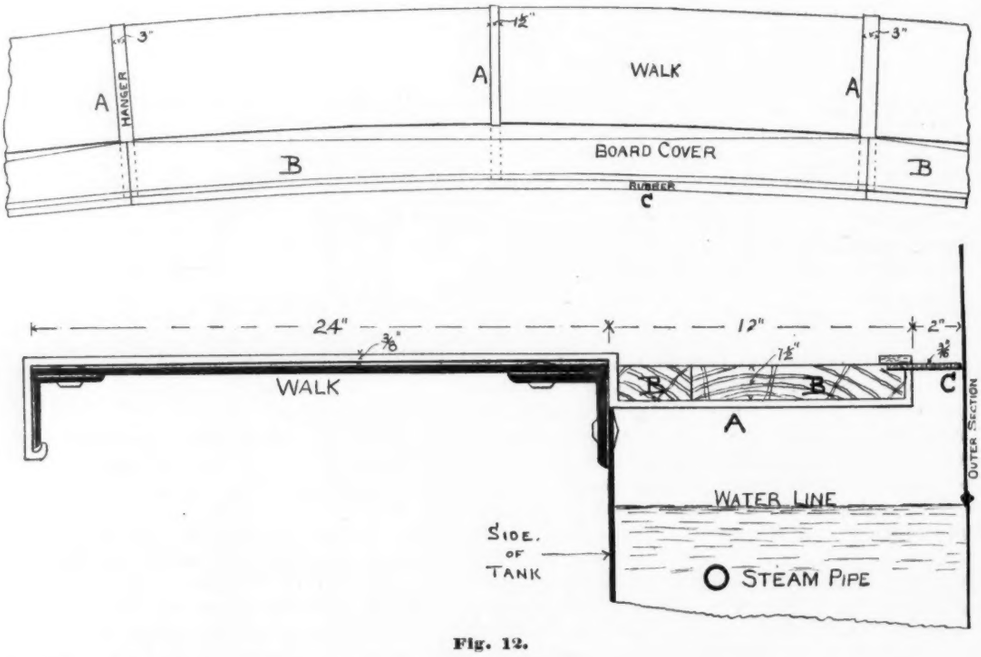


Fig. 12.

Mr. Irwin Butterworth, of Columbus, and Mr. E. G. Cowdery, of Milwaukee, also called attention to this device.

13. *Heating Holder Tanks.*—The customary way is to conduct steam under the surface of the water in the tank of a gasholder, inserting elbows and nipples, pointing either to the right or to the left, in order to induce a current and circulation. The steam so blown out and into the water has a tendency to heat the water near the surface, and to induce surface circulation only.

Mr. J. D. Shattuck, of Darby, Pa., states that if, over each steam nipple *D*, a tee *E* is slipped, attached by suitable bushing *F*, with a side outlet *A*, pointing down towards the bottom of the tank, the water that is heated is drawn up through the inlet *A*, more from the body of the tank than is otherwise the case, and a considerably better circulation is secured than in the customary way, and less steam will be required.

14. *Indicating Valve for Purifiers.*—Mr. Robt. Young, of Pittsburg, Pa., calls attention to an arrangement of valves that he has found of great assistance in connection with his purifying plant. This plant is

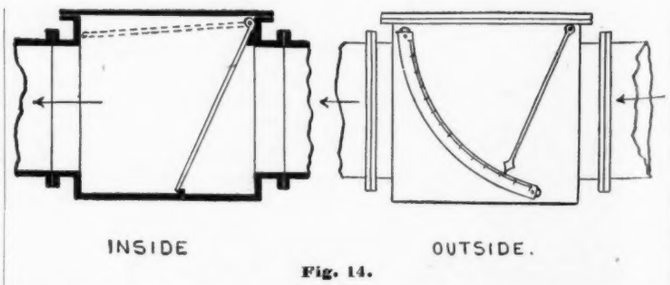


Fig. 14.

of such a size as to require two sets of boxes and the subdivision of the gas into two streams. When at times one set of boxes gives a little more resistance than the other, the gas takes the line of least resistance and has a tendency to principally go through one set. It is impossible to know of this condition externally, or until the one set shows foul gas much sooner than it should. Mr. Young corrects this by inserting, in the run of the pipe, what he calls two indicating or sluice

valves, one at the inlet of each group of boxes. Each valve is simply a cast iron box, having in the upper corner a small transverse shaft carrying a light plate pendant from it. If both sets of purifiers give the same resistance, they will each take the same amount of gas, and the indicating valve on each set will be opened to the same degree. If, however, more gas is going through one set than the other, one of the indicating valves will be more open than the other, whereupon the regular valve on the set of boxes that is taking the most gas is shut down somewhat, forcing the proper proportion of gas through the other set. The shaft in the regulating valve comes through a small stuffing-box and carries a pointer on the outside, so that the position of the place inside is seen at a glance.

15. *A Cheap Blast Lamp.*—Mr. John T. Mason, of the Columbus (O.) Company, forwards a description of a home made blast lamp, made in an instance where he did not desire to go to the expense of purchasing a regular one. The apparatus consists of a large bottle *A*, fitted with a two-hole stopper. Near the base of the bottle is a goose-neck overflow *D*. Over the bottle is suspended an aspirator, connected to a hydrant and the bottle with suitable rubber tubing. When the water is turned

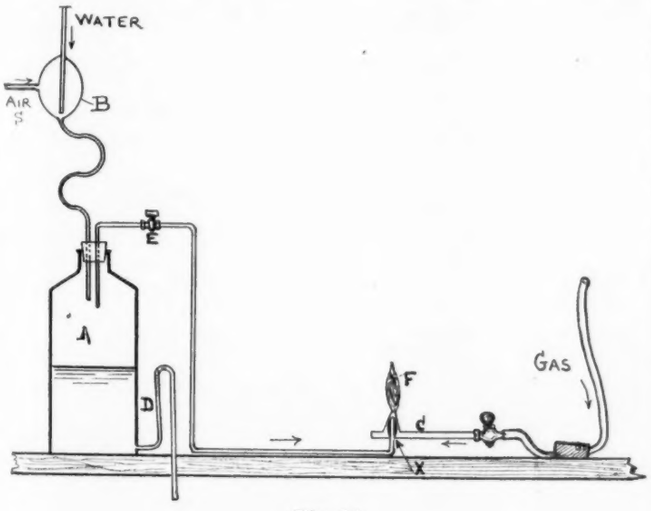


Fig. 15.

on it flows in and through the aspirator, and draws air in with it through the opening *S*. This air fills the space in the bottle over the water and passes out through the pipe, regulated by the stopcock *E*, to the lamp *F*. The lamp itself is made of an old tin blowpipe, converted by cutting a hole in the back of it, just opposite the outlet, at the point marked *X*, and inserting a small tube so that the inner end will be partly in the outlet of the blowpipe. The other, or mouthpiece end, is connected with the gas supply tube *C*.

16. *Tar Drain for Hydraulic Main.*—Mr. George MacMillan, of Appleton, Wis., describes an arrangement in use with him for many years for satisfactorily draining off the heavy tar from the bottom of a hydraulic main. *A* is the main; *B* the pressure equalizing pipe to the tar gate, *F*; *C* is the tar pipe proper; *E* the usual tar and water overflow to the tar well at the floor level, and *G* the overflow to main tar well; *D* is a special 1¼-inch pipe taken out of the bottom of the tar pipe *C*, controlled by cock *H*, and discharging into the funnel *J*. By opening the cock *H*, at suitable intervals, the heavy tar in the bottom of the main can be drained off until the workman observes water following, when it is closed until more tar accumulates.

17. *Portable Privy for Street Main Gang.*—A gentleman of such natural and innate modesty that he requests his name be not used, forwards a description of a portable privy, locally dubbed the "What-is it?" that he has found useful while laying gas mains with large gangs, particularly in residential districts. With 30 or 40 men daily asking for time off, the aggregate loss of time is considerable. Moreover, the various selective bumps of locality, as well as the habits of some of the men, were not such as, to say the least, appealed to the residents of the neighborhood. To overcome some justifiable complaints, and an old wagon body happening to be on hand, a portable privy was constructed upon it, with a sand box and removable drawer underneath on the lines indicated by the sketch. This was located in

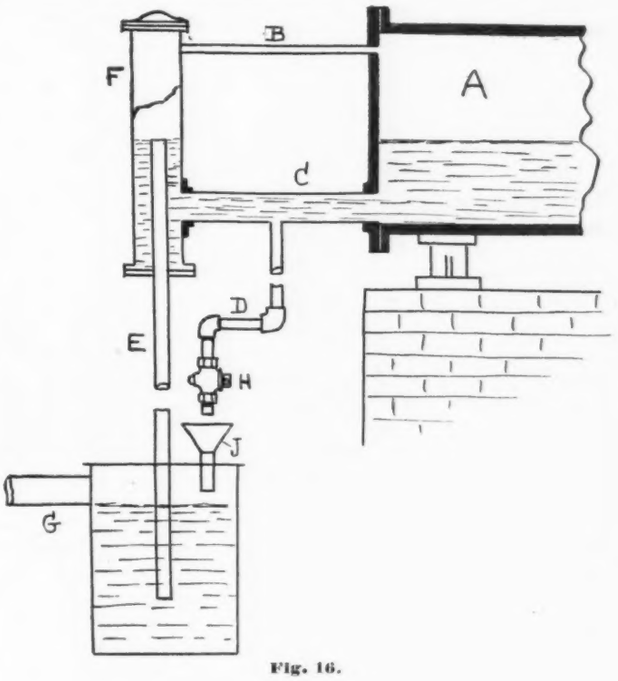


Fig. 16.

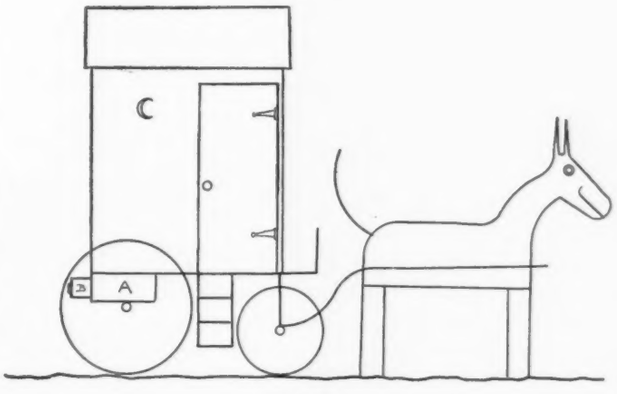


Fig. 17.

a side street, being shifted from day to day as required, and enabled the handling of the daily applicants who "Desire to be excused," upon a definite, speedy and cleanly basis.

Having finished reading, Mr. Shelton said: Since receiving these Wrinkles, and too late for publication, three or four more came to hand. They are not now in a shape to read. I simply wish to acknowledge their receipt and to express thanks for them, and to state that, with the consent of the Association, they will appear with the others in the final printed volume of the proceedings of the meeting. In this connection I want to call attention to an idea I have in respect to this department. I am well satisfied, as far as my own experience goes, that the Wrinkle Department each year is looked forward to with interest, and that a majority of the Wrinkles we get are useful. Probably each Wrinkle is helpful to one or more men. And if a single Wrinkle is helpful to any member it has justified the existence of the Wrinkle Department. Unfortunately we straightway forget the Wrinkles that we hear read each year—at least I do. I think a majority of the members find that a year later they have forgotten what has gone before. There are probably two or three hundred wrinkles, mostly good, but lost in the records of this Association and of the Pacific, the Ohio and such other organizations as have brought them out. I venture to say that while we may have a hazy idea of having seen a Wrinkle in the past which is apropos of something we have in mind, rarely anyone of us remembers definitely what it is, nor do we know just where to look for it. It seems to me that a compilation in pamphlet form of all the Wrinkles which have been brought out, with cuts and brief descriptions, would be one of the handiest things about a gas office that we could have in the business. The expense of such a compilation would be moderate, for we could probably borrow the cuts

from the Gas Journals of the Wrinkles that have appeared from time to time illustrating the articles that have appeared. I would be very glad indeed to compile the Wrinkles, in the near future, well before the next meeting; and if the proposition appeals to you I make the suggestion that I be empowered to compile and prepare in pamphlet form all of the Wrinkles that have been brought out in gas circles in the United States, from the start of the Wrinkle idea in Progressive Age several years ago. Of course it may be said that the Wrinkles can all be found in the proceedings of the Association, and in the future can there be found; but as a matter of fact there are only 12, 15 or 20 in each volume, and many members, especially new members, for one reason or another may not have the proceedings of the Association, and may not get them. I think it would be well worth while to incur the little extra expense of printing them in separate form and binding the pamphlet in moderately stiff covers—the pamphlet containing the practical, everyday Wrinkles of American gas business—which can then be circulated without expense among the members of this Association, and it would involve comparatively small additional expense for the Western Association to have struck off a few extra copies, in order to present them with its compliments to members of other Associations, if it should see fit. I make the suggestion and leave it in your hands.

Mr. Brown—I think the idea of Mr. Shelton an excellent one. Some years before the Western Association started its Wrinkle Department we had a wrinkle department in the "Progressive Age," and I would be very glad to contribute these cuts and wrinkles to the volume suggested by Mr. Shelton.

Mr. Britton—The Pacific Coast Associaiion will deliver to Mr. Shelton all the cuts used in the preparation of our Wrinkle Department, and on my return to the Coast I will see they are forwarded to him.

Mr. Shelton—It would be my idea that rather than wait until next year to have authorization to spend the $100, or whatever may be required, for printing, that the resolution should be put in such shape that if, in the judgment of the Council of the Association, the expense of printing the pamphlet is within reasonable bounds, authority be now given then to go ahead with it and not wait another year for the formal authorization to print. I would suggest that the expenditure of a reasonable amount of money for such purpose (in the judgment of the Council) be authorized.

On motion of Mr. Gimper, seconded by Mr. Brown, the publication as suggested by Mr. Shelton was approved, and authorization given the Council to make the necessary expenditure.

On motion of Mr. Mayers a hearty vote of thanks was tendered to Mr. Shelton for the able manner in which he discharged his duties as Wrinkle Editor.

Report of Committee on Isolated Generators for Bench Firing.

The President—We will next take up the report of the Committee on Isolated Generators for Bench Firing.

Mr. Steinwedell—Mr. Bredel, Chairman of the Committee, is not here. I have a very short report summing up what has been done, and in the absence of Mr. Bredel I will read what I have gotten out.

Since the last meeting of the Western Association a year ago no startling developments have appeared in the use of isolated generators for bench firing, but the main points brought out by the committee, and discussion on this subject at that time, seemed to indicate that the success of this style of construction depends on the following relative comparisons with the present methods employed:

(1), First cost; (2), cost of repairs; (3), cost of labor in operating; (4), cost of fuel for firing; (5), reliability.

The first cost will depend on how many benches each generator shall serve, how many generators there would be to a stack, how many retorts would go in an arch, and whether forced draught would be necessary.

The cost of repairs will depend on the evenness of temperature maintained in the benches, the efficiency of the valves for regulating the amount of producer gas entering the benches, and the cost of repairs on the generators.

The cost of labor in operating will vary with the amount of skill and knowledge required to operate the generators and regulate the heats in the benches.

The cost of fuel for firing would be less if the expense of construction would permit the producer to be set deep enough to fire it with hot coke. The comparative amount of radiation would also have to be taken into consideration.

Mr. George Helps, of Nuneaton, England, stated in a paper before a recent meeting of an English Association: "There is no real advantage to be gained in fuel consumption by heating the primary or secondary air with waste gases, and that all the advantages claimed for recuperative can be obtained by generator settings."

Admitting this to be the case brings the isolated generator into a much more favorable light. The plants of this kind in existance are still undergoing experiment and improvement. The method of heating a stack of benches by means of gas from a common generator does not, as far as could be ascertained, exist on the Continent of Europe. Benches on the Munich system, of which there are several large installations, have one generator for two benches. Former experiments in this line were unsatisfactory on account of the drop in the temperature of the producer gas, and the number of leaks. In England there are isolated generators heating stacks of benches at the Dawsholm Works, Glasgow, and at the South Metropolitan Gas Works, Vauxhall, S. E.; the latter being an installation of inclined retorts.

On motion of Mr. Ramsdell the report was received and the committee discharged, with the thanks of the Association for the faithful performance of its duty. It was also moved and carried that the proper authority in the Association be authorized or instructed to secure a paper on isolated bench firing for presentation at the next meeting, and also a paper on regenerative benches.

On motion, the following resolution offered by Mr. F. Egner was laid on the table:

"That the President appoint a committee of five members of this Association, whose duty it shall be to prepare a standard form or forms, to be used when presenting statements to this Association, relating to the manufacture, distribution, or accounting for the products of our manufacture. Said committee shall have the power to correspond with members of this and other Associations upon the subjects connected with their work, invite suggestions, and expend a sum not exceeding $50 in the prosecution of their investigations. The report shall be presented to this Association at the next annual meeting for amendment or approval."

Some Routine Business.

The President appointed Mr. E. G. Pratt, of Des Moines, Iowa, the member to represent the Association on the Conference Committee of other Associations regarding the policy of forming a National Bureau of Advertising.

The President—In the Address of the President it was suggested that the Association should send delegates to the International Gas Congress at Paris, France, to be held at the Universal Exposition next September. The report of the Committee on the Address left it with the President to do as he thought best. What action would the Association consider acceptable in the premises?

Mr. Norris—Is there any objection to authorizing the President to appoint the delegates from the membership of the Association who expect to attend the Congress?

The President—I do not think there can be any objection to that.

Mr. Norris—There is no particular limit to the number; and it is right for anyone to have a credential of that sort.

The President—If there is no objection it will be considered that the officers of the Association will give credentials to those members who desire to attend the Congress. Mr. A. W. Littleton, our former Secretary, is likely to attend the Congress (he is now in Europe), and I think it would be well to instruct him to act as a delegate of the Association. Mr. I. C. Copley, our President-elect, is also in Europe, but I believe it is his intention to return home before the Congress is held.

Mr. Ramsdell—I think it would be well to further instruct Mr. Littleton to the effect that he is expected to report upon the Gas Congress at the next meeting of the Western Association.

The President—I would also suggest that our Secretary inform Mr. Copley that he is expected to bring back what information he can gather as to the isolated regenerator matter. The suggestion that he will be expected to report on it would make him look into it more carefully. I believe this completes everything of a business nature. We will now discuss the queries remaining in

THE QUESTION BOX.

The Secretary—The second question (the first was discussed yesterday) is:

> "What is the best course to pursue against advocacy of municipal ownership of gas and electric plants for public and private lighting?"

Mr. Shelton—It is too late in the day to answer that as it should be. If I were in a town where that question arose, I think I would go out of my way to look up the results of public ownership in as many towns of the same size and character as I could find, and I would then give

those facts the widest possible publicity in my own town and before the right people. I think that the publicity of the facts most pertinent to your own particular case is about all that can be said off-hand in answer to the question.

Mr. Doherty—This is one of many questions that I am interested in. Yesterday we discussed a topic that was really in accord with this question—as to the policy of public control of rates, etc. I suggested then it was regrettable that the different industries affected by threats of municipal control did not make an effort to unite and pull together in the direction of their common interest. The question of municipal control of gas and electric light companies, and of all other semi public corporations, is one that interests gas, electric and street railway men alike, and while their interests may differ at other points, they are exactly similar on this one point. I wish all the Associations could find some way of getting together, for I know a great deal more could be done if there were some way of bringing these various Associations together on this one point so they would work along the same line. Last Fall the League of American Municipalities held a convention at Saratoga, N. Y. I was invited to attend this League meeting and to present a paper against municipal ownership, and was also invited by two of our electrical associations to represent them. I went to the convention, and while I have paid a great deal of attention to this subject, I was simply appalled to see the sentiment in favor of municipal ownership.

Mr. Russell—For the last eight years in our city, on each renewal of the city contract with the gas company, we have had this whole fight over again. I think the most effective way to manage this question of municipal ownership is through the responsible manufacturers of apparatus. Most of the manufacturers give credit, or receive pay partly in cash and partly in bonds, some of which are not worth much, and in that way promoters manage to build works. One of the largest manufacturers in the country has now shut down on that kind of business, and it has had more to do with cutting off municipal ownership in the South than anything else. I am a member of the Electrical Association which meets in Chicago next week, and I believe that if the gas and electrical associations would unite upon some effective way of educating the people, it would do more good than all the talk we can bring forth in the conventions. Last winter I had the pleasure of visiting what we call the model municipal plant of the South, at Jackson. I remained there three or four days, seeing all that I could but keeping my mouth shut; and there dawned on me a new light which I think will be of interest to the Association. Asking them about rates I learned the fact that they are there selling current for less than it costs to produce it. Of course the taxpayers have to bear the burden.

At the conclusion of the discussion, on motion of Mr. H. L. Doherty, the President was empowered to appoint a committee of one to confer with committees appointed by other associations on the question of municipal ownership.

The President announced that he would name the committee at a later time.

The Secretary—The next question is:

"What is the best method of stopping leaks in a brick tank?"

Mr. Howard—I had some experience in this line. I built a new tank, 60 feet in diameter, the foundation of which was partly in sand and partly in clay, a formation that I did not discover until the excavation was begun. After the tank was finished and filled with water it cracked in the center of the wall plate. I tried in many ways to stop the leak, and corresponded with different people, finally corresponding with the firm who did the iron work on the tank. They wrote me to take the purifying material as it came out of the boxes and work it up into a soft slush, mixing sufficient of it to go around the tank. Then to take it by the pailful and drop it in close to the wall; also to connect a pipe with the end bent to the tank bottom, the pipe having 1¼ opening, and as the material got to the bottom to have this spray work around so as to move the material around all over the floor of the tank. I did so. The first application of the material lessened the leak more than one half, and in less than three weeks it was perfectly tight. Prior to that I had used different materials, such as horse manure, bran, etc. Just the spent lime from my purifiers, mixed up in a slush, made the tank tight. The leak was in the side.

The Secretary—The last question is:

"What success has been accomplished through the introduction and use of the Yusea Welsbach mantle?"

The question was not debated.

Report of Committee on Final Resolution.

The Committee on Final Resolutions presented the following report:

Gentlemen: Your Committee on Final Resolutions beg leave to report the following:

The thanks of this Association are due to the Committee of Arrangements who have so well provided for our comfort and pleasures during our stay in the city, and also have added to the success of the present meeting.

To the press of Chicago for courtesies shown in reporting proceedings of sessions.

To the President, Mr. Wm. McDonald, for the careful and courteous manner in which he carried on the business of the Association.

To the Secretary and the other officers for faithful performance of duties; and last, but not least, to the Chicago Gas Company.

John Gimper, Paul Doty, } Committee.

The report of the Committee was adopted by rising vote, the question being submitted by Mr. Ramsdell.

The President—Before we adjourn I wish to express my thanks to the members of the Association, and my appreciation of the aid they have given me by doing all they could to make this meeting an enjoyable and a profitable occasion. I thank you all for your uniform kindness and courtesy.

The meeting was then declared adjourned.

Operating Economies in Central Station Practice.

[Abstracted from a paper, read by Mr. W. L. Abbott, Chief Operating Engineer of the Chicago Edison Company, at the Chicago Convention of the National Electric Light Association.]

In every central station there grow up characteristic systems of practices, good, bad or indifferent, due partially to peculiar environments and partially to the ability of the operating force. Through natural selection the best of these practices are gradually crystallized and become the unwritten code of rules for the direction of the internal affairs of the station. Some of these practices, while the very best for that station in which they originate, may prove very unsatisfactory when transplanted into other stations; yet it is largely due to the cordiality with which central station managers impart to and adopt on trial from each other new methods that the present rapid improvements in operating details are being made.

The saving with renovating of waste and oil is an ever present and variously handled question in all stations. Some simply use the waste until it is oil soaked, and then burn it under the boilers; others go to the other extreme and use wiping towels, which are carefully saved, washed and used over again. We favor a middle course, using a good quality of waste, first on the finer parts of the machinery and then for coarser work, after which it is put through a washer consisting of a train of rolls, over which hot water is running. This extracts nearly all of the oil and much of the dirt.

The oil and water are caught in a receptacle, the oil separated and passed to the oil purifier and the waste is put into the drier. This drier consists of a sheet iron box 30 inches square and 6 feet high, filled with shelves, one above another, made of wire netting and spaced about 10 inches apart, for the reception of waste to be dried. The case stands a few inches from the floor, and in the bottom, which is open, is a steam coil. A door occupies one full side, and to the top is connected an 8-inch galvanized pipe leading to the boiler breeching for the purpose of inducing a draft. The whole thing is quite simple and inexpensive, yet it will thoroughly dry a charge of 200 pounds of damp waste in a few hours. This dry waste is somewhat harsh and knotty, but has better absorbing qualities than new waste, and we use and wash it over and over again.

The oilers are allowed but ¾ pound of new waste on a shift to keep a 1,200 horse power engine clean, but they are allowed all of the washed waste they want. In separating oil from waste it is difficult to say which is the by-product and which the direct product, as from 100 pounds of oily waste we get 40 pounds each of oil and waste, and one product is about as valuable as the other.

The amount of engine oil used at our Harrison street station has been reduced to the lowest possible minimum, I think, as it amounts to only about 50 gallons of new oil each month. This is obtained by catching and refining all the lubricating oil used on our machinery, which is quite readily possible on vertical engines. The drains from our crank

pits are carried down into the oil refiners, and the oil from the waste is all saved and put through a process which makes it better than new oil. This may sound like an exaggerated statement, but I will explain later on why it is better than new oil. I have spoken of oil refiners and of refining the oil, instead of filters and filtering the oil, for the reason that we have no filters and do no filtering, but purify the oil by settling and boiling. Our refiners consist, essentially, of three upright cylindrical tanks, the first of which receives the oil from the engines mixed with cylinder drips and water from journals, etc. In this tank, which is half full of water and half full of oil, the water and oil separate. The water goes to the bottom, where it is drawn off through a trap. The oil goes to the top and is drawn off through an overflow leading to the bottom of the second tank, in which is a steam coil under a pressure of about 100 pounds. This is for the purpose of heating the oil up to about 250°, at which temperature the water is driven off in the form of steam.

Owing to the surface tension of the oil around the small globules of water held in suspension, the water will not vaporize at a lower temperature. This tank is of such a capacity that the oil is about two days in passing through it, and it then goes to the bottom of the third tank, where it is allowed to stand about the same length of time and where any sediment it may contain will be deposited. From the top of the third tank the oil overflows into a large storage tank, where it is kept until drawn off to be used. Few of those who have not looked into the matter would realize how much water will be absorbed and held in suspension by oil which contains a small trace of animal matter and how difficult it is to break up the combination once it is formed. Those of you who operate oil filters may have sometimes wondered at the accumulation of grease in them, this grease being a soft, jelly-like substance of the consistency of warm lard, or perhaps even thicker. This grease is no more than a combination of mineral oil, a small trace of animal oil and about 40° water. If it were placed in a vessel and heated to about 250°, the water would be driven off (perhaps with explosive force if heated too rapidly, but if the work is carefully done the water can be separated), and what is left would be the best kind of lubricating oil, containing a small trace of animal oil and in our case all the cylinder oil from which the animal oil is derived. It is the mixture of the cylinder oil with the engine oil which gives it its heavier body and better lubricating qualities. The oil which is expressed or washed out from the waste apparently contains more cylinder oil than that which comes from the engine drains, and on this account those who throw away their waste not only lose the waste, but the richest part of the oil which is contained in it. That this amount is considerable will be seen from the fact that from every 100 pounds of oily waste we get about 40 pounds of clean waste and 40 pounds of oil.

The question of cylinder lubrication was once a very perplexing one for us, but after studying and experimenting we settled the question in such a way that it has not been open for several years. We had great trouble with cylinder oil, and had difficulty in finding an oil which would lubricate all of the cylinders of our triple-expansion engines from one lubricator. We have not found such an oil and do not expect to. We could find an oil which would lubricate the high pressure cylinder, and we could find an oil that would lubricate the low pressure, but we could not find a combination which would lubricate all of the cylinders perfectly. We have, therefore, adopted an oil which will lubricate the high pressure cylinder excellently and the intermediate cylinder moderately well, while the low pressure shows only a slight trace of oil. As there is no cutting or scratching in the low pressure while it runs dry, and as the high pressure cylinder makes a prompt and vigorous protest if allowed to run dry for a few moments only, we have adopted the oil which will give the best results in the high and let the low be content with what it gets.

The results of our experiments have convinced us that the only oil to use in a non-jacketed cylinder, where it would come in contact with very wet steam, is one which is very highly compounded. It must also be an oil of a high fire test, and the reason why it does not lubricate the low pressure cylinder as well as the high is that the temperature of the steam in the low pressure cylinder is so low that the oil will not remain atomized in the steam, but washes down and combines with the water of condensation which has formed in the other two cylinders, and passes through the low pressure cylinder in an emulsion with the water. To prove this theory I have tried the plan of mixing a cylinder oil of a high grade and high flash test with a light oil of low flash test, and feeding it through one lubricator through all three of the cylinders. The result shows a fair trace of oil on the walls of the low pressure cylinder, and we ran our engine with this kind of cylinder lubrication for several months, but finally decided that the best results for the entire engine were obtained with that oil which gave the best lubrication in the first cylinder. We now use a heavily compounded high fire-test oil fed into the steam pipe near the throttle. A gallon of oil so fed will give good lubrication for a 1,200-horse power engine for 12 hours. I have seen a compound engine of this capacity fed at the rate of nearly a gallon an hour without obtaining satisfactory lubrication, the whole trouble lying in the fact that the oil was not adapted to the particular conditions under which the engine was working, and I think this may account for the unmeasured praise or unstinted abuse which different brands of good oil receive from different engineers, and I think, furthermore, that the difference between a good oil and a poor oil made from high fire test stock lies almost wholly in the amount and kind of compounding.

In arranging an operating force and the payroll of the central station the superintendent should aim to get the maximum of results with the least expenditure of money and still to keep everything harmonious. To do this he should carefully arrange his force so that he will at all times have men enough to take care of the amount of work on hand and at no time have a surplus of help over what is required to take care of the work to be done. His scale of wages should also be carefully graded, so that the men doing the same class of work should receive the same pay, and that the rate of pay to the different classes of workmen should be in proportion to the skill, responsibility or manual labor required. Further than this, a considerable saving in money can be made by paying the men partially in hopes and promises. By this I mean to have a well defined line of promotion, each man knowing his position in that line, and that his chances for promotion depend upon his ability, fidelity and length of time in the service. Any really good, ambitious young man is ready to begin work at the bottom of the ladder, and will work contentedly along on small wages if he is assured that the promotions to come will be awarded upon the above terms, and not by favoritism. The most demoralizing and disorganizing practice that can be introduced into a central station is to put a new man, the relative of some official, or the friend of some politician, into a desirable position over the heads of equally good men who have borne the drudgery and hard work of inferior positions, hoping and expecting that when there was a vacancy in a better position they would have the preference.

In many stations the force is divided into a night gang and a day gang, but I never thought this well adapted to central station work. The hours are too long, and it does not give the best distribution of labor, the number of men in the station not varying according to the load. The practice which we instituted several years ago of bringing the men on one or more at a time an hour or so apart and letting them off in the same way can be made to exactly meet the requirements of an uneven load, and enables us to rotate the different men of the same class through all the different shifts during the course of one or two months, thus making the work and the hours of all exactly alike in the cycle. At the end of each week the schedule is made up for the week to come for each of the different classes of operatives interested, and this is posted on Saturday night, so that as the men go off work on the following Sunday it is known what shift each will have during the coming week. These schedules are altered from week to week, increased or diminished as regards the number of men and changed in form to conform to the varying conditions of the load curve.

To illustrate by a set of December schedules: The problem to be solved is to arrange the schedule so that there will be at any time enough men for the work without having too many men around at other times, and, furthermore, to arrange the shifts so that none will be obliged to go home between the hours of 1 and 6 A.M. As we are not sure what the load will be from day to day, or a week ahead, we are obliged to provide men enough to take care of what we assume will be the reasonable maximum. With a little care and study, it is possible to arrange the schedule to very nearly meet the exact requirements. Take, for example, the firemen's schedule for the week commencing December 18, 1899. We start at midnight with five firemen; two of these are relieved at 1 A.M. by two other men, who come on at that time. As the load from midnight to 6 A.M. is quite irregular, owing to the variable amount of charge required by the battery from day to day, we have rather more firemen on during this period for the amount of work done than we have during other times of the day. At 6 A.M. the load begins to pick up, and has nearly reached its morning maximum by 9 A.M. To take care of this our force of firemen is increased by one man each at 6, 7 and 8 o'clock, there being by that time eight men on, and the force is held at that number until 1 P.M. During this time several men come on and others leave, but the number at work remains the same. The slight drop of the load at noon is not followed by a

corresponding change in the number of men, but it is taken advantage of as a slight breathing spell and gives the men an opportunity to clean fires and eat their dinners. After the midday drop in the load there follows a gradual rise until 4 P M., which we anticipate by bringing a man on at 1 and another at 2 P M. At 4 P M. the load rises abruptly to the maximum shortly before 5 P.M. We provide for this by bringing three men out at 3 P.M. to get their fires in good shape ready for this hard pull, and, finally, at 4 P.M. the last man comes, which brings the total number of firemen on at this time of the day up to 14 men. After 5 P.M. the load gradually declines, until at midnight it is only about one-fourth as high. Owing to the way in which the men have been brought out their shifts are finished so that the force is automatically decreased in proportion as the load decreases, and we have during the day worked 21 firemen, who have altogether burned about 200 tons of coal, and have been so distributed that we have at all times had an excess of one or more men for the work, and none have been overworked.

The greatest possibilities for saving or wasting about a steam plant are undoubtedly in the coal pile, but the subject does not receive the consideration to which it is entitled. The average ambitious engineman will spend much time and care on his engine to be sure that the indicator cards are perfectly symmetrical, that the points of cut-off are equal, that the release is in time and that the compression rises to meet the admission in a smooth, rounded curve. This is proper and commendable; yet the same time spent in studying the conditions of combustion in his furnace might show him a way to make a saving in fuel fourfold greater than is possible in the final refinements of the indicator cards. A fireman whose wages amount to, say 20 cents an hour, will burn during that time fuel costing 10 and 15 times as much as his wages. It would not be possible by any sort of driving to save half of the wages, but it is readily possible by properly watching and instructing the fireman to save double his wages in coal. In the first place, great care should be exercised in the selection of the coal to be used. I believe that the cheapest coal is that kind which has the greatest amount of combustible for the least amount of money, provided the furnaces are of the proper kind and ample in capacity to make the required amount of steam from them. The very cheapest kind of Illinois screenings, costing less than $1 50 a ton, will not have less than 10,000 British thermal units a pound, and the very best of Eastern lump, costing $4 a ton, will not have more than 14,000 British thermal units a pound. This means, then, that for equivalent heating qualities the cheapest screenings cost about half as much as the high grade coal.

Having selected the coal, the next problem is how to burn it properly. It is commonly understood that 12 pounds of air are needed to properly burn 1 pound of coal. It is also commonly supposed that in practice about twice this amount of air passes through the fire, but just how much actually passes and under what conditions are the best results obtained are impossible to determine without making analyses of the flue gases. Fortunately, this has now become a very simple operation and one which can be performed and understood by anyone competent to take charge of a large boiler room. These tests often show the most surprising and disappointing results. The analyses are made to determine the percentage of carbon dioxide in the flue gases. Under perfect conditions it can run as high as 20 per cent., but it is not unusual to find samples running as low as 2 per cent. of dioxide. This brings down the economy for two reasons: (1), the gas in the firebox is diluted with an excess of cold air and cooled down, and (2), the amount of gas being increased in volume passes the boiler more rapidly and does not give up so much of its heat. It is almost a paradox that within reasonable limits the more the gases are cooled down in the furnace by the admission of excess of air the hotter they will pass away from the boiler. The two causes of excess of air in the flue gases are running boilers on too light loads and careless firing.

In a station where the load is much higher for a few hours than during the rest of the day the tendency is to have too many boilers in service during the period of light load. The natural result is that the fires are run thin, the grates get bare in places, a great volume of air is drawn in and only a small portion of it comes in contact with the fuel. Careless firing is always a flagrant waste of fuel. An engineman may be aware that he is not getting the results which his tests lead him to believe he should have, and yet in a boiler room where several men are working it is exceedingly difficult to fasten the blame on any one of them unless one tests the flue gases.

To follow intelligently the work of the individual fireman we have installed in our boiler room a device called the econometer, through which is induced a small current of gas from a boiler breeching. The weight of this gas, changing with its composition, moves a pointer across a dial, thereby indicating continuously the varying percentage of carbon dioxide in the flue gas. From this device are run individual pipes to the breeching of each boiler, and all is so arranged that samples may be drawn from several boilers and tested in a few minutes, or a continuous test may be made of the performance of any one boiler. Readings taken from this instrument at regular and short intervals, when plotted, form a curve which is a very comprehensive record of the conditions of combustion during the time of observation.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE authorities of Gainesville, Fla., have purchased the local gas plant from the executors of the estate of Mr. W. B. Goodwin and will hereafter operate the same on municipal account.

MR. WALTER R. ADDICKS, of Boston, Mass., writing to the JOURNAL under date of the 6th inst., says: Dear JOURNAL: In the discussion of Mr. Frederick H. Shelton's paper, on "Distributing Gas Under Higher Pressure," page 888 of the JOURNAL, you make me say: "In the presence of an electric current I question the wisdom of laying cast iron pipes." What I did say was, "In the presence of an electric current I question the wisdom of laying *wrought* iron pipes." I would add, in using the term wrought iron, I intend to include steel pipe likewise. The wrought iron main laid as stated was under favorable conditions beyond the reach of return current from electric railways.

THE proprietors of the Kenton (O.) Gas and Electric Company, in the consideration of what they may charge for a lighting supply under their charter, have instituted an action against the local authorities for a construction of the rate that may be charged by them to the public and to the ordinary consumer.

AT the annual meeting of the Toledo (O.) Gas Light and Coke Company the officers chosen were: Directors, George W. Davis, John Cummings, Edwin Jackson, M. W. Young, S. C. Walbridge and C. R. Faben; President, John Cummings; Secretary and Treasurer, C. R. Faben.

THE new gas plant of the Raleigh (N. C.) Standard Gas and Electric Company is said to be in successful operation.

THE proprietors of the Bergen County (N. J.) Gas and Electric Company are making an extensive addition to their power house. The new building is rated to house 4 boilers of 350-horse power each.

AT the annual meeting of the Binghamton (N. Y.) Gas Works the officers chosen were: Directors, E. McMillin, W. F. Douthirt, Jas. W. Manier, W. G. Phelps, G. F. O'Neil, George W. Dunn, S. J. Hirschman, C. M. Stone and C. C. Jackson; Secretary, W. F. Douthirt; Treasurer, J. W. Manier; Asst. Sec. and General Manager, Fred. B. Wheeler.

THE proprietors of the Essex and Hudson Gas Company, of Newark, N. J., have purchased the properties, Nos. 571 and 573 Broad street, and 9 and 11 Central avenue, adjoining their present handsome office building. It is presumed that the new space will be covered by structures designed to show prominently apparatus and devices used for spreading the sale of gas.

THE proprietors of the Lowell (Mass.) Gas Light Company propose to extend their mains to the adjoining hamlet of Chelmsford Center.

"PROF." EDWARD BEMIS has been retained as the expert for the city authorities of Springfield, Mass., in the contention of the latter, before the Massachusetts Board of Gas and Electric Light Commissioners, that the Springfield Gas Light Company should be obliged to reduce its selling rates. The "Professor" does not seem to have much else to do.

THE purchasers of the Bath (Me.) Gas and Electric Company have altered the name of the corporation to that of the Sagadahoc Light and Power Company.

THE proprietors of the Los Angeles (Cal.) Lighting Company have reduced their selling rate for gas on fuel account to $1.50 per 1,000 cubic feet.

THE initial hearing over the petition for a revision of the rates charged by the Lowell (Mass.) Gas Light Company will likely be held in the Common Council board room of Lowell the morning of next Thursday. At least such was the agreement reached some days ago between Mayor Abbott and the Board of Gas and Electric Light Commissioners.

THE gas and electric lighting interests of Kenosha, Wis., have been completely merged, the title of the succeeding corporation being that of the Kenosha Gas and Electric Company. Its officers are: President and Treasurer, E. G. Cowdery; Vice-President, James Cavanagh; Secretary and General Manager, F. W. Bowen.

MR. E. F. LLOYD, Secretary of the Western Gas Construction Company, Fort Wayne, Ind., writing under date of the 7th inst., says:

"You may be interested to know that the increase in our business the last two years has been such as to entirely outstrip our previous facilities, and that to meet the expected demand this season we built and equipped an entirely new boiler shop, and were so fortunate as to secure all the requisite machinery of the most improved type and get it delivered promptly, so that the shop was put into use about two months ago, and it has been running full time since on contract work. It also became evident that our previous sources of supplies for castings would be entirely inadequate for our needs, and we decided in February to put up our own foundry. Work was immediately commenced and pushed through with such expedition that the first heat was taken off on the 14th of May. Everything ran smoothly and without hitch, and the foundry is now working up to almost its full capacity of 10 to 12 tons daily. The increased capacity was put into commission only in the nick of time, the amount of work secured having been in excess of all previous years, large as was the business of 1898 and 1899. Among the more important of the contracts secured was a complete new plant throughout for the Cowdery Construction Company at Racine, Wis., including the bench castings for 10 benches of 6's, and our improved system of coal gas condensing and scrubbing apparatus of half a million cubic feet capacity. Also, an installation of purifiers on the Beal duplex system, an ammonia concentrating apparatus of 100 tons capacity, exhausters and engines, oxide conveyor, ammonia storage tanks, etc., complete. We are also installing our complete coal gas condensing and scrubbing system for the Consolidated Gas Company, of Long Branch, N. J., including also a 50 ton ammonia concentrating plant of our improved design, together with bench castings for the Company's new coal gas plant. We are under contract to supply practically the same class of equipment for the Binghamton (N. Y.) Gas Works, as well as for the People's Light Company, of Davenport, Iowa. This last embraces also a contract for an improved Lowe water gas apparatus and our purification system. At Davenport we erect the works complete, including the buildings and the holder tank. These are only a few of the more important contracts that we have on hand, and are mentioned particularly because they comprise our complete condensing and scrubbing system, adopted without alteration, and the correct design of which has now been thoroughly tested in a number of works which have been completed by us."

AT the annual meeting of the Pawtucket (R. I.) Gas Company the officers chosen were: Directors, Lyman M. Darling, Olney Arnold, Hezekiah Conant, Eben H. Littlefield, Frederick W. Easton, James G. Fales, Jonathan Chase, Darius L. Goff, Edwin A. Perrin and Stephen A. Jenks; President, Lyman M. Darling; Secretary and Manager, Wm. McGregor.

MR. JOHN A. HALL has been elected a Director in the Southbridge (Mass.) Gas and Electric Company, vice Mr. Jacob Booth, deceased.

CAPTAIN JOHN W. HALL has resigned the Presidency of the Consolidated Gas Company, of Baltimore, but still remains a Director. His successor is General Ferdinand C. Latrobe, whose special qualification for his new duties seems to lie in the fact that he was Mayor of Baltimore for several years. From the Baltimore papers announcing the resignation of Captain Hall we learn that he first became connected with the gas business in 1877, at the time of the starting of the Consumers Gas Company, of Baltimore, and was elected President thereof in 1878. In 1880, when all the gas interests of Baltimore were amalgamated under the title of the existing Consolidated Company, Captain Hall was elected its President, a position he held ever since.

THE following are the main points in the report of the Board of Gas and Electric Light Commissioners to the Massachusetts House of Representatives, respecting an order by the House that the Commissioners should investigate and determine what in their opinion would be a fair selling price for gas in New Bedford, Mass.:

"The New Bedford Gas Light Company was chartered by special act in 1850. Up to the year 1888 it supplied to the city and citizens of New Bedford gas only. In that year, pursuant to the general law of 1887, and with the authorization of this Board, the Company undertook the supply of electric light, and for that purpose purchased the plant and business of the New Bedford Electric Light Company. In the same year an unsuccessful attempt was made to also secure the Edison Electric Illuminating Company, of New Bedford. In 1890, after a sharp and costly competition with this Company, its plant and business were purchased under authority of a special legislative act. At this time the Company's name was changed to the New Bedford Gas and Edison Light Company. It has since extended the supply of electric light across the Acushnet river to the town of Fairhaven.

"Prior to undertaking the electric lighting business the authorized capital stock of the Gas Company was $250,000, with outstanding notes of about $120,000. Its stock has since been increased, principally for the purpose of exploiting the electric lighting business, to its present amount of $550,000, all of which appears to have been paid in full and much of it at a liberal premium. It has now outstanding notes, issued for expenditures upon its plant, to the amount of $150,000.

"Prior to 1890, the dividends for a considerable period had been at the rate of 8 per cent. per annum, and before that 10 per cent. had been regularly paid. Immediately after the purchase of the Edison Company the dividends were reduced to 6 per cent. per annum in quarterly disbursements, and this rate has been continued to the present time, except that the last two quarterly payments have been at the annual rate of 7 per cent.

"Bills for gas are rendered monthly. The present gross price is $1.50 per 1,000; if payment is made on or before the 10th of the month in which bills are rendered, a discount of 10 per cent. is allowed on all bills where the consumption has been as much as 3,300 feet during the month covered by the bill. If the bill shows a consumption ranging above 3,300 feet, and not over 4,000 feet, the bill is discounted to $4.50, without regard to the price per 1,000. When bills at the gross rate amount to as much as $6, the discount is at 25 per cent. Certain large consumers, few in number, are supplied at a special rate of $1. Gas is supplied to the city for street lighting at a fixed price per lamp per night, and this includes the cost of lighting the lamps as well as the repair and care of the lanterns. This contract probably nets the Company something less than $1 per 1,000 feet for its gas. The present rates were established in 1896, but the custom of discounts for prompt payment at a varying rate, based upon the amount consumed, was introduced some years prior to that date. Whatever view may be held as to the expediency of this practice generally, it is doubtful if it would be wise at this time under all the circumstances to radically interfere with a custom so long established.

"During the 9 months of the current fiscal year ending April 1st about 9 per cent. of the Company's entire output was supplied to the city for street lamps; of the sale to private consumers, about 4 per cent. to the large consumers at $1, and 60 per cent to a class of small consumers paying either the gross rate or receiving only the 10 per cent. reduction. A great part of that supplied at $1 is used for manufacturing purposes exclusively.

"For the year ending June 30, 1899, the period covered by the last annual return of the Company, the income from its gas business exceeded the operating expenses by about $47,000.

"Since that date there has been a large advance in the market price of virtually all the materials used by the Company, notably, of the two most important, coal and oil. The contract for the latter terminating in the summer of 1899, the advance has affected to a substantial degree the operating expenses of the current year, but as the coal contracts have only recently expired, the result of the advance in the price of this material has not yet become manifest. As the effect upon the profits of the extra cost of oil has been to some extent neutralized by an increase of about 15 per cent. in the Company's output, the difference between the operating expenses and income for the current year may be fairly estimated at not much less than in the year ending with June 30, 1899, say about $45,000. Based upon the current year's output a reduction of 10 cents per 1,000 in the $1.50 and $1.35 rate and the increased cost of coal at present prices would reduce this apparent profit by about $11,000.

"To pay a dividend of 6 per cent. upon the present capital would require $33,000. For the purpose of enlarging its works and placing its electrical wires underground in response to what appeared to be a proper public demand, the Board has approved an issue of new capital of the par value of $100,000. To pay interest upon the outstanding notes previously referred to, at say 5 per cent., will require $7,500 more, making the total charges of this character $46,000. It will not be unfair to impose half of this expense, say $23,000, upon the gas department. Deducting these two amounts, or $34,000, from the $45,000 stated above, leaves $11,000. All of this amount and any additional likely to come from any increase in output probable in the immediate future, will evidently be needed for the extraordinary repairs which ought at once to be undertaken.

"In view of the facts stated, its is quite apparent that the 10 cent reduction referred to above will be equivalent in its effect upon the Com-

(*Concluded on page* 983.)

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

Notification Respecting Advertising.—Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co. 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, JUNE 18, 1900.

(*Continued from page* 982.)

pany's economy to a reduction of more than 20 cents per 1,000 if the prices for materials had remained as in 1899.

"The Board begs to offer the following recommendations with respect to the gas to be supplied by the New Bedford Gas and Edison Light Company on and after the 1st day of July next:

"First—That the gross price shall not exceed $1.40 per 1,000 cubic feet.

"Second—That the net price shall not exceed $1.25 per 1,000.

"Third—That under the conditions which now secure a discount of 25 per cent. from the present gross rate, the discount shall be 20 per cent. from the gross rate mentioned above.

Respectfully submitted,

"FORREST E. BARKER,
"MORRIS SCHAFF,
"CHARLES H. GIFFORD. } Commissioners."

The Market for Gas Securities.

The shares in the New Amsterdam Gas Company assenting to the terms of its proposed merging with the Consolidated Gas Company are well over the number required. Official announcement of the fact was made by President Gawtry of the Consolidated Company the afternoon of the 14th inst. The time fixed by the committee having in charge the pooled stock of the Standard Gas Light Company for the turning over of the same to its intending purchasers, on the basis of 135 for the common and 155 for the preferred, less 2 per cent. to cover charges and expenses, has been set for June 29th. The local gas share market was dull during the week, with steadiness a characteristic. Consolidated sold up to 192, and closed to-day (Friday) at 190¼ to 191. Mutual is stiffly held.

Brooklyn Union scored a fair advance, the opening bid to-day being 170. There was good trading during the week in Peoples, of Chicago, at slightly better prices. Consolidated, of Baltimore, sold up to 59½. General Latrobe has succeeded Captain Hall as President of the Company. The United Gas Improvement Company has declared a quarterly dividend of 2 per cent., payable July 14th.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JUNE 18.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$54,595,200	100	190⅜	191
Central Union, Bonds, 5's	3,000,000	1,000	103½	105
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	310	315
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co.	13,000,000	100	25	25¼
Preferred	10,000,000	100	49½	50
Bonds, 5's	11,000,000	1,000	103½	104
Northern Union, Bonds, 5's	1,250,000	1,000	95	97
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	115	..
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100		135
Preferred	5,000,000	100	148	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	110	114
Yonkers	299,65	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	170	..
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	1¼	1⅜
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works..	450,000	100	.	35
" 1st Mtg. 5's	475,000	1,000	96½	99½
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5¾	6¼
" " Bonds, 5's	5,250,000	1,000	64	67
Central, San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,207,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	105
Cincinnati G. & C. Co.	8,500,000	100	200¾	201
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	59⅜	59¾
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12½	15
" Con. Mtg. 5's	380,000	1,000	82	86
Consolidated G. & E. Co.'s, Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,560,000	50	95¾	96
" Prior Lien 5's	4,598,000	1,000	99½	100
Detroit Gas Co., 5's	386,000	1,000	100	101
" Inc. 5's	16,000	100	100½	101
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	35	41
" Bonds	2,000,000	..	60	64
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	220
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	102	105
Indianapolis	2,000,000	..	90	100
" Bonds, 6's	2 650,000	..	100	104
Jackson Gas Co.	250,000	50	72	78
" 1st Mtg. 5's	250,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	101½	103
Lafayette Gas Co., Ind.	1,000,000	100	40	45
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	106	
Laclede, St. Louis	7,500,000	100	73½	75
Preferred	2,500,000	100	98	100
Bonds	10,000,000	1,000	110	110½
Madison Gas & Elec. Co.	400,000	100	75	80
" 1st Mtg. 6's	350,000	1,000	102½	108
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000	..	..	103
Essex and Hudson Gas Co.	6,500,000	..	35	40
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	99½	99⅝
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111¾	111⅛x
2d "	2,500,000	1,000	104	105
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	47¼	47½
St. Paul Gas Light Co.	1,500,000	100	57½	58½
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	88	90½
St. Joseph Gas Co.	1,000,000	100	42	44
" 1st Mtg. 5's	750,000	1,000	96½	98
Syracuse, N. Y.	1,750,000	100	..	14
Bonds	1,612 000	1,000	88½	93
Washington, D. C	2,600,000	20	270	271
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	95	98
Bonds, 5's	3,830,500	.	104	106
Wilmington, Del.	600,000	50	200	210

Advertisers' Index.

GAS ENGINEERS.

	Page
Wm. Henry White, New York City	1003
Fred. Bredel, Milwaukee, Wis.	990
Geo. R. Rowland, New York City	1001
The Western Gas Construction Co., Fort Wayne, Ind.	1008
Humphreys & Glasgow, New York City	1001
American Gas Co., Phila., Pa.	990
David Leavitt Hough, New York City	1000
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	987
Baxter & Young, Detroit, Mich.	1000
United Gas Improvement Co., Phila., Pa.	995
James T. Lynn, Detroit, Mich.	1000
A. E. Boardman, Brevard, N. C.	1000

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd's Sons, New York City	1004
Continental Iron Works, Brooklyn, N. Y.	1002
Deily & Fowler, Phila., Pa.	1004
Kerr Murray Mfg. Co., Fort Wayne, Ind	1000
Stacey Mfg. Co., Cincinnati, Ohio.	1004
Bartlett, Hayward & Co., Baltimore, Md.	1001
Davis and Farnum Mfg. Co., Waltham, Mass.	1000
R. D. Wood & Co., Phila., Pa.	1002
Isbell-Porter Company, New York City	1002
Fred. Bredel, Milwaukee, Wis.	990
United Gas Improvement Co., Phila., Pa.	995
National Gas and Water Co., Chicago, Ills	997
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	987
The Western Gas Construction Co., Fort Wayne, Ind.	1008
Humphreys & Glasgow, New York City	1001
American Gas Co., Phila., Pa.	990
Logan Iron Works, Brooklyn, N. Y.	1004
Riter-Conley Mfg. Co., Pittsburgh, Pa.	1003
Baxter & Young, Detroit, Mich.	1000
Berlin Iron Bridge Co., East Berlin, Conn	989
G. Shepard Page's Sons, New York City	1000
James T. Lynn, Detroit, Mich.	1000
A. E. Boardman, Brevard, N. C.	1000
Sutherland Construction & Improvement Co., N.Y. City	989
Chris. Cunningham & Son, Brooklyn, N.Y.	986

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	1001
United Gas Improvement Co., Phila., Pa.	995
Burdett Loomis, Hartford, Conn.	1002
National Gas and Water Co., Chicago, Ills.	997
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	987
The Western Gas Construction Co., Fort Wayne, Ind.	1008
Humphreys & Glasgow, New York City	1001
Sutherland Construction & Improvement Co., N.Y. City	988
B. E. Chollar, St. Louis, Mo.	988

SCRUBBERS AND CONDENSERS.

R. D. Wood & Co., Phila., Pa.	1002
James R. Floyd's Sons, New York City	1004
Continental Iron Works, Brooklyn, N. Y.	1002
Logan Iron Works, Brooklyn, N. Y.	1004
Riter-Conley Mfg. Co., Pittsburgh, Pa.	1003

TAR AND CARBONIC ACID EXTRACTOR.

R. D. Wood & Co., Phila., Pa.	1002

AMMONIA CONCENTRATORS.
Michigan Ammonia Works, Detroit, Mich..... 985
American Gas Company, Phila., Pa..... 990

GAS METERS.
John J. Griffin & Co., Phila., Pa..... 964
American Meter Co., New York and Philadelphia.....1007
Helme & McIlhenny, Phila., Pa.....1007
D. McDonald & Co., Albany, N.Y.....1005
Nathaniel Tufts Meter Co., Boston, Mass..... 1006
Maryland Meter and Mfg. Co., Baltimore, Md.....1006
Metric Metal Co., Erie, Pa..... 1007
Keystone Meter Co., Royersford, Pa.....1006
Detroit Meter Company, Detroit, Mich..... 1007

PREPAYMENT METERS.
American Meter Co., New York and Philadelphia.....1007
John J. Griffin & Co., Phila., Pa..... 964
D. McDonald & Co., Albany, N.Y..... 1005
Helme & McIlhenny, Phila., Pa.....1007
Nathaniel Tufts Meter Co., Boston, Mass.....1006

GAS AND WATER PIPES.
M. J. Drummond & Co., New York City.....1005
R. D. Wood & Co., Phila., Pa.....1002
Warren Foundry and Machine Co., New York City.....1005
Donaldson Iron Co., Emaus, Pa.....1005
Chris. Cunningham & Son, Brooklyn, N.Y..... 986
Cornell & Underhill, New York City..... 985
Charles Millar & Son Co., Utica, N. Y.....1005

GAS MAIN STOPPERS.
Safety Gas Main Stopper Co., N. Y. City..... 987

GAS TAPPING MACHINES.
George Light, Dayton, O..... 985
H. Mueller Manufacturing Company, Decatur, Ills..... 985

STEAM BLOWER FOR BURNING BREEZE.
H. E. Parson, Brooklyn, N. Y..... 987

GAS COALS.
Penn Gas Coal..... 999
Perkins & Co., New York City..... 998
Despard Gas Coal Co., Baltimore, Md..... 999
Westmoreland Coal Co., Phila., Pa..... 999
Berwind-White Coal Mining Co., New York and Phila... 998

CANNEL COALS.
Perkins & Co., New York City..... 998
Greasy Creek Cannel Coal and Tramway Co., Chicago . 985

CONVEYORS.
The Link-Belt Machinery Co., Chicago, Ills..... 987

GAS ENRICHERS.
Standard Oil Co., New York City..... 999
The Sun Oil Co., Pittsburgh, Pa..... 999

COKE CRUSHER.
C. M. Keller, Columbus, Ind..... 999

GAS GAUGES.
The Bristol Co., Waterbury, Conn..... 986

GAS GOVERNORS.
Connelly Iron Sponge and Governor Co., New York City 997
Isbell-Porter Co., New York City.....1002
R. D. Wood & Co., Phila., Pa.....1002

CEMENTS.
C L. Gerould, Galesburg, Ills..... 996

RETORTS AND FIREBRICKS.
J. H. Gautier & Co., Jersey City, N. J..... 996
Adam Weber, New York City..... 996
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 996
Cyrus Borgner, Phila., Pa..... 996
James Gardner, Jr., Co., Pittsburgh, Pa..... 996
Henry Maurer & Son, New York City..... 996
Baltimore Retort and Firebrick Co., Baltimore, Md..... 996
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 996
Brooklyn Firebrick Works, Brooklyn, N. Y..... 996
Missouri Firebrick Co., St. Louis, Mo..... 996

REGENERATIVE FURNACES.
Bartlett, Hayward & Co., Baltimore, Md.....1001
Fred. Bredel, Milwaukee, Wis..... 990
J. H. Gautier & Co., Jersey City, N. J..... 996
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 996
Adam Weber, New York City..... 996
Missouri Firebrick Co., St. Louis, Mo..... 996

SELF-SEALING MOUTHPIECE DOORS.
Isbell-Porter Co., New York City.....1002
Continental Iron Works, Brooklyn, N.Y.....1002
Logan Iron Works, Brooklyn, N. Y.....1004
R. D. Wood & Co., Phila., Pa.....1002

INCANDESCENT GAS LAMPS.
Welsbach Commercial Co., Phila., Pa..... 994

BURNERS.
C. A. Gefrorer, Phila., Pa.....1002
Wm. M. Crane Co., New York City..... 987
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 987
Crescent Novelty Mfg. Co., Chattanooga, Tenn..... 984

LAVA GAS TIPS.
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 987
Crescent Novelty Mfg. Co., Chattanooga, Tenn..... 984

STREET LAMPS.
Welsbach Street Lighting Co., New York and Phila..... 992
Thos. T. W. Miner, New York City..... 984

PURIFIERS.
Stacey Mfg. Co., Cincinnati, O..... 988

PURIFYING MATERIALS.
Connelly Iron Sponge and Governor Co., New York City 997

VALVES.
Ludlow Valve Manufacturing Co., Troy, N.Y..... 986
Chapman Valve Manufacturing Co., Boston, Mass..... 986
R. D. Wood & Co., Phila., Pa.....1002
Continental Iron Works, Brooklyn, N. Y..... 1002
The P. H. & F. M. Roots Co., Connersville, Ind..... 991
Isbell-Porter Co., New York City..... 1002
The Western Gas Construction Co., Fort Wayne Ind... 1008

EXHAUSTERS.
The P. H. & F. M. Roots Co., Connersville, Ind..... 991
Isbell-Porter Company, New York City..... 1002
Connelly Iron Sponge and Governor Co., New York City 997

ELECTRICAL APPARATUS.
Wm. Henry White, New York City.....1003

ENGINES AND BOILERS.
The Hazelton Boiler Company, New York City..... 985

PURIFIER SCREENS.
John Cabot, New York City..... 986

GAS STOVES.
American Meter Co., New York and Philadelphia..... 993
Maryland Meter and Manufacturing Co., Baltimore, Md. 1006
Keystone Meter Co., Royersford, Pa..... 1006
Nathaniel Tufts Meter Co., Boston Mass..... 1006
Dangler Stove and Mfg. Co., Cleveland, O..... 985

GASHOLDER TANKS.
J. P. Whittier Brooklyn, N. Y.....1001

GASHOLDERS.
Bartlett, Hayward & Co., Baltimore, Md.....1001
Continental Iron Works, Brooklyn, N. Y.....1002
Deily & Fowler, Philadelphia, Pa.....1004
Davis & Farnum Mfg. Co., Waltham, Mass.....1000
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 1000
Stacey Mfg. Co., Cincinnati, Ohio..... 1003
R. D. Wood & Co., Philadelphia, Pa..... 1002
Logan Iron Works, Brooklyn, N. Y 1004
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 1003

STORAGE TANKS.
Chris. Cunningham & Son, Brooklyn, N.Y..... 986

GAS SECURITIES.
Henry Marquand & Co., New York City..... 983

ADVERTISING.
J. Howland Harding, New York City..... 984

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILA., PA., June 13, 1900.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable July 14, 1900, to stockholders of record at the close of business, June 30. Checks will be mailed.

1306-4 LEWIS LILLIE, Treasurer.

Position Wanted

As Foreman of a Retort House,

By a man thoroughly competent to manage a house of any size. Is conversant with the operation of benches, fired under old or new systems. Has had 27 years' experience Can furnish any reference desired. Address "W. R. T.,"

1305-2 Care this Journal.

Position Wanted

By a Man who is not Afraid of Hard Work.

Has had 20 years' experience in all the departments—manufacturing, distribution, new business and office work.

Address "W.,"

1296-tf Care this Journal.

Position Wanted

As Manager or Engineer of a Gas Company.

Thoroughly Competent Gas Manager of many years' experience in the manufacturing and the executive ends of a Gas Company desires a position as Manager or Engineer of a Gas Company selling not less than 50,000,000 cubic feet per annum. Highest references given. Address "T.,"

1267-tf Care this Journal.

SUPERINTENDENT WANTED.

Bright, unmarried young man, familiar with the outside work of a gas company, wanted to take charge in a very small, but good, growing town, near Philadelphia. Business can be increased, and there is a good future for right man. State age, experience and pay expected.

Address "D. N.,"

1305-tf Care this Journal.

WANTED,

TO LEASE GAS PLANTS.

The advertiser is prepared to make propositions for the leasing of gas plants upon favorable terms.

Address "RESPONSIBLE,"

1365-tf Care this Journal.

WANTED,

A SECOND-HAND EXHAUSTER.

A second-hand 8 inch exhauster, complete, with engine, by pass and connections. Must be in good condition.

Address CITY OF LINCOLN GAS COMPANY,

1364-3 Lincoln, Ills.

FOR SALE.

Second-Hand Pipe.

A quantity of 6-inch, 8-inch and 12-inch second hand cast iron pipe for quick delivery. Description and prices on application. Address CONSUMERS GAS COMPANY,

1305-2 Johnstown, Pa.

FOR SALE,

A New Condenser and Scrubber,

Each 11 feet 6 inches high, 3 feet in diameter, inside measurement, and 6-inch connections—all connections reinforced. Two manholes to scrubber, with two sets of trays; also one 6-inch center valve. These have never been used.

Address PEEKSKILL GAS LIGHT COMPANY,

1300-tf Peekskill, N. Y.

For Sale.

A Small Gas and Electric Light Plant,

in a Southern city of 3,800 inhabitants.

Address FORT WAYNE ELECTRIC CORPORATION,

1097-tf Fort Wayne, Ind.

Gas Companies and Gas Appliance Exchanges, Attention!

We will **save** you nearly **30 per cent.** on your **Steatite** or **Lava Gas Tips.**

Manufacturers of all kinds of **Lava Tips** and **Acetylene Gas Burners.**

Headquarters for the **domestic E. H. Tips, superior** to the imported and **lower in price.** All sizes from ½ to 12-foot. Address

THE CRESCENT NOVELTY MFG. CO.,
Inventors of the King Burner and Sole Manufacturers.
1305-4 309 Carter Street, Chattanooga, Tenn.

"THE MINER"

Globe

Street and Boulevard

Lamps.

Cheapest and Best.

THOUSANDS IN USE WITH INCANDESCENT BURNERS.

Send for Catalogues.

THOMAS T. W. MINER,

821-823 Eagle Av., N. Y.

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator,

Not Expensive. Write to STROH & OSIUS, Pat'ees, or Mich. Ammonia Works, Detroit, Mich.

HENRY MARQUAND & CO.,

BANKERS

AND

BROKERS.

160 Broadway, New York City.

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.

Geo. Light,
DAYTON, O.

CORNELL & UNDERHILL,

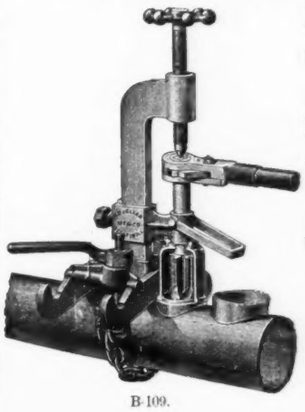
Wrought & Cast Iron Pipe,

MALLEABLE AND CAST IRON FITTINGS,

Brass and Iron Cocks and Gate Valves,

43, 45 AND 47 BEACH ST., NEW YORK.

MUELLER SPECIAL ATTACHMENT MACHINES



B-109.

Never fail to find a good word from progressive managers.

A very simple attachment added to our regular B-108 gives absolute protection to your service men from being overcome by gas.

Means less labor to a tap and more taps to the day.

CATALOGUE FROM

H. MUELLER MFG. COMPANY,
DECATUR, ILLS.

KENTUCKY CANNEL COAL, FOR GAS AND DOMESTIC USE.

GEO. R. HISLOP, F.C.S., F.R.S.S.A., Gas Engineer of Paisley, Scotland, says in his analysis: "This is a remarkably rich Cannel Coal, yielding illuminating matter per ton equivalent to 1,945 lbs. of sperm candles." This coal mined and shipped in box cars. Write for sample car and delivered price.

The Greasy Creek Cannel Coal and Tramway Co.,
163 WEST WASHINGTON STREET CHICAGO, ILLS.

HIGH PRESSURE **WATER TUBE BOILERS**
Economy, Safety, Capacity, Durability.
THE HAZELTON BOILER
The Pioneer Vertical Water Tube Boiler of the World
STACKS, TANKS AND MISCELLANEOUS METAL WORK
THE HAZELTON BOILER CO.
Sole Manufacturers NEW YORK, U. S. A.
Telephone, 1229 18th St. Cable Address "Paila," N. Y.

A NEW

DANGLER GAS RANGE.

Send for New Catalog.

Dangler Stove & Mfg. Co.,
CLEVELAND, OHIO, U. S. A.

TRAYS FOR GAS WORKS

Circulars and Prices on Application.

John Cabot,

553-557 West Thirty-third Street, New York.

Bristol's Recording

PRESSURE GAUGE.

For continuous records of

Street Gas Pressure.

Simple in construction, accurate in operation, and low in price.

Fully Guaranteed. Send for Circulars.

THE BRISTOL CO.,

Waterbury, Conn.

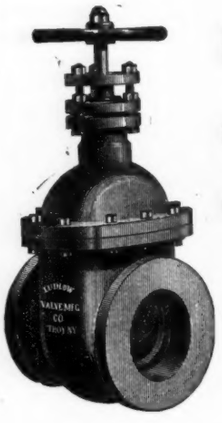
CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.

Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St.



THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

CHRIS. CUNNINGHAM & SON,

PROPRIETORS,

THE NOVELTY STEAM BOILER WORKS,

BROOKLYN, N. Y.

STORAGE TANKS FOR GAS WORKS,

To Retain Fluid Material of Any Sort.

PIPING IN AND AROUND GAS WORKS.

Work Done for Several of the Largest Gas Companies in America Stands as Reference.

W. H. PEARSON, Prest. W. H. PEARSON, Jr., Vice-President. J. T. WESTCOTT, M.E., Manager. L. L. MERRIFIELD, M.Inst.M.E., Chief Engineer.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION CO., LD.

American Offices: 269 FRONT STREET, EAST, TORONTO, ONT.

London Offices: 19 ABINGDON STREET, WESTMINSTER, S.W.

Telegraphic Address: "CARBURETED LONDON AND TORONTO."

The above Company have erected since 1893, or are now erecting, their universal type of Carbureted Water Gas Plants at the following Gas Works:

	Cubic Feet Daily.
Blackburn, England	1,250,000
Windsor Street Works, Birmingham, England	2,000,000
Saltley Works, Birmingham, England	2,000,000
Colchester, England	300,000
Birkenhead, England	2,250,000
Swindon (New Swindon Gas Company), England	120,000
Saltley Works, Birmingham, England (Second Contract)	2,000,000
Windsor Street Works, Birmingham, England (Second Contract)	2,000,000
Halifax, England	1,000,000
Toronto	250,000
Ottawa	250,000
Toronto (Second Contract, Remodeled)	2,000,000
Lindsay (Remodeled)	125,000
Belleville	250,000
Ottawa (Second Contract)	250,000
Brantford (Remodeled)	200,000
St. Catherine's (Remodeled)	250,000
Kingston, Pa.	125,000
Montreal	500,000
Peterborough, Ont.	250,000
Wilkesbarre, Pa.	750,000
St. Catherine's (Second Contract)	250,000
Buffalo, N. Y.	2,000,000
Winnipeg, Man.	500,000
Colchester England (Second Contract)	300,000
York, England	750,000
Rochester, England	500,000
Kingston, Ont.	300,000
Crystal Palace District, England	2,000,000
Duluth, Minn.	300,000
Caterham, England	150,000
Enschede, Holland	150,000
Leicester, England	2,000,000
Buenos Ayres (River Platte Co.)	700,000
Burnley, England	1,500,000
Kingston-on-Thames, England	1,750,000
Accrington, England	500,000
Tonbridge, England	300,000
Stretford, England	500,000
Oldbury, England	300,000
Saltley Works, Birmingham, England (Third Contract)	2,000,000
York, England (Second Contract)	750,000

Steward Burners.

Closest Attention to **Durability, Candle Power, Finished Appearance.**

Samples to be Had for the Asking.

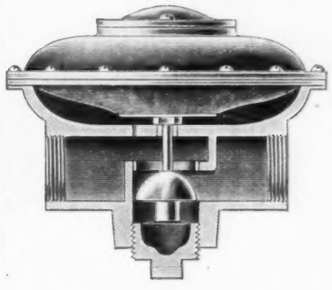
Write for neat vest pocket memorandum book. Sent Free.

The D. M. Steward Mfg. Co.,

New York Office, 107 CHAMBERS ST. CHATTANOOGA, Tenn.

AN EVEN PRESSURE AT ALL TIMES!

Is Insured by Using the



"Vulcan" Gas Controller

For All Kinds of Gas, Including Acetylene.

NO MERCURY OR GLYCERINE USED.

It is the most simple, inexpensive and effective governor on the market.
Made in three sizes only.
Should be attached by the gas company to insure correct work and best results.

EVERY CONTROLLER GUARANTEED ABSOLUTELY. LARGE DISCOUNT TO GAS COMPANIES.

W. M. CRANE COMPANY,

FOUNDRY: PEEKSKILL, N. Y. 1131 and 1133 Broadway, New York.

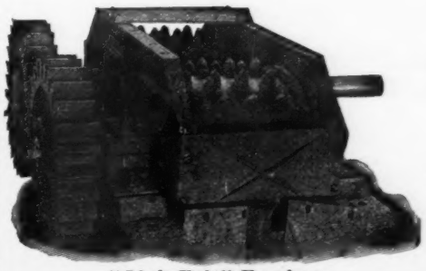
SAFETY GAS MAIN STOPPER CO.

1790 PARK AVE., N. Y

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS

THE LINK-BELT MACHINERY CO.,

ENGINEERS, FOUNDERS, MACHINISTS,
Chicago, U. S. A.



"Link-Belt" Breaker.

LINK-BELT ELEVATING & CONVEYING MACHINERY for HANDLING COAL, COKE, OXIDE, ETC.

Tilting Coal and Coke Cars,
Breaker Rolls, Shaking Screens,
Power Transmitting Machinery.

Machinery designed and erected to suit existing conditions and available space.

CATALOGUE UPON APPLICATION.

Sutherland Construction & Improvement Co.

Offices: 15 WALL ST., NEW YORK, and OSHKOSH, WISCONSIN.

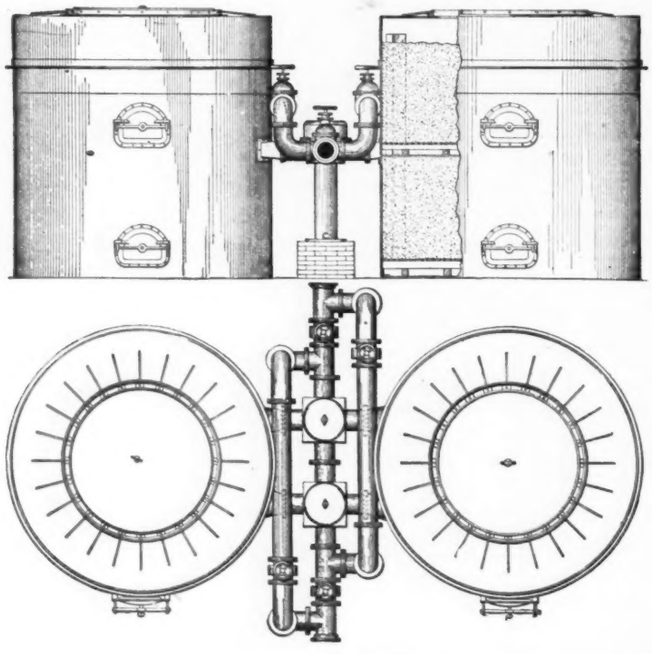
Owners of the "SUTHERLAND" Patents for Water Gas Apparatus.

Gas, Electric Light, Water Works, and Electric Street Railways Built, Remodeled, Operated, Bought and Sold.

A few of the places where the SUTHERLAND Apparatus is in successful operation:

Ilion, N. Y.
Herkimer, N. Y., 2 orders.
Little Falls, N. Y.
Fishkill-on-Hudson, 2 orders.
Clifton Springs, N.Y., 2 orders.
Green Bay, Wis.
Stevens Point, Wis.
Tarrytown, N.Y., 3 orders.
Ft. Henry, N. Y.
Gainsville, Fla.
Hollidaysburg, Pa.
Waterville, N. Y.
Huntington, L. I.
Lexington, Mo.
Mendota, Ill.
Circleville, O.
Joplin, Mo.
Ashville, N. C.
Youngstown, O.
Kingston & Rondout, N.Y.

CORRESPONDENCE SOLICITED.



CHOLLAR'S SYSTEM OF GAS PURIFICATION.

Covered by Five U.S. Patents.

In operation, revivification of the oxide is effected by repeated reversals of the direction of the flow of the gas through the beds (in the two boxes used under this system there are eight different routes for the gas to take) whereby the purified gas is made to revive the oxide in parts of the apparatus while the foul gas is fouling it in others.

The boxes are charged or discharged from the sides as well as the top.

There are no Hydraulic Cups or heavy covers.

Either end of the apparatus is inlet or outlet at pleasure.

The capacity is increased five-fold or more over ordinary methods without addition to building.

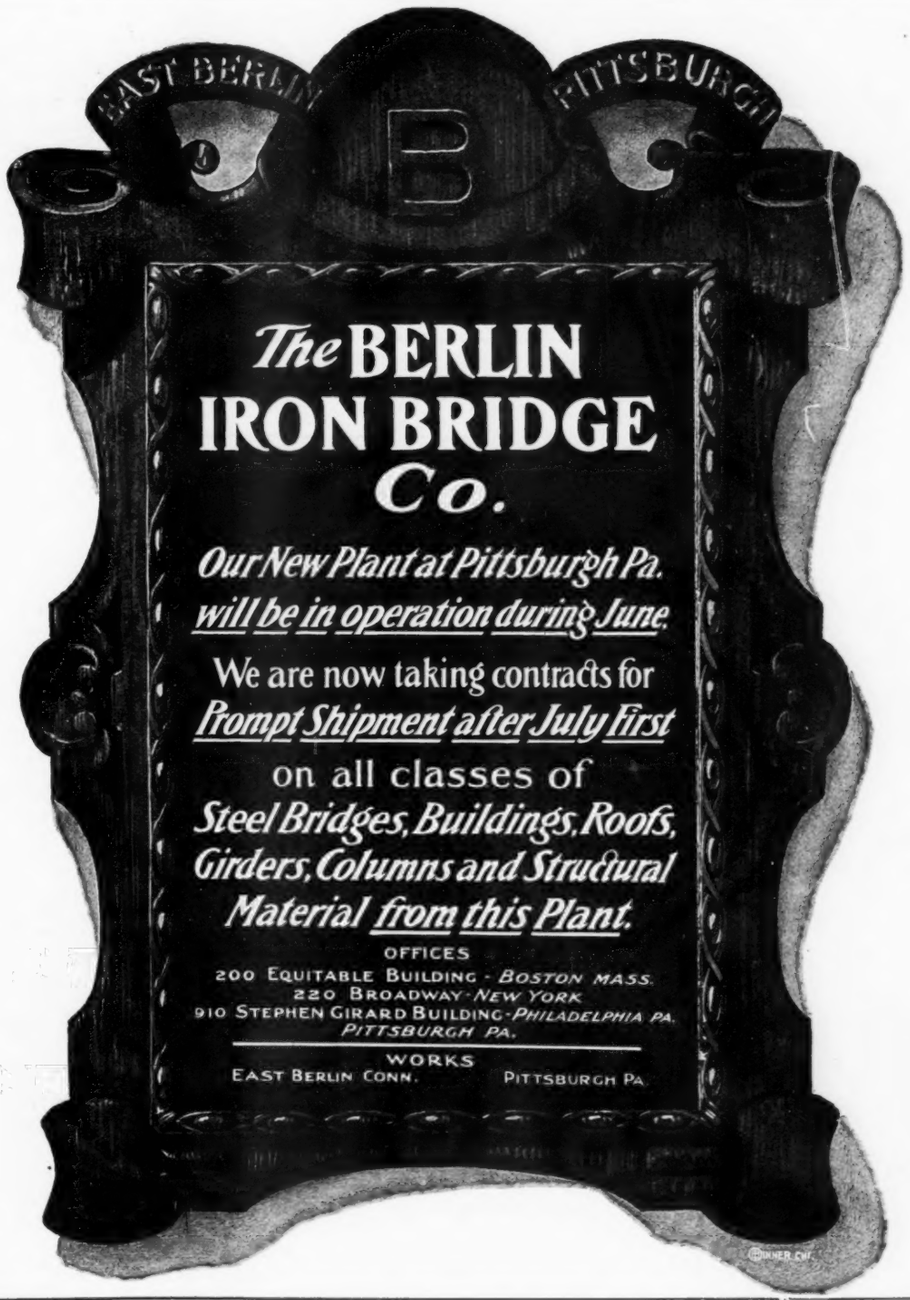
The apparatus costs less than for any other system.

For Estimates Write **The Stacey Mfg. Co.,**
SOLE MANUFACTURERS,
FOR FURTHER INFORMATION WRITE **CINCINNATI, OHIO.**
B. E. CHOLLAR, 411 N. 11th St., St. Louis, Mo.

Coal Tar Genealogical Tree.

Mr. T. Viner Clarke, of London, Eng., having compiled a novel Chart or Map illustrating the various CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR, in the form of a Genealogical Tree, including all the products discovered (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

A. M. CALLENDER & CO., No. 32 Pine Street, New York.



FIELD'S ANALYSIS

For the Year 1898.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the Thirtieth Year of Publication.
Compiled and Arranged by

JOHN W. FIELD,

Secretary and General Manager of The Gas Light and Coke Co., London.

Price $5. For Sale by

A. M. CALLENDER & CO., - No. 32 Pine Street, N. Y. City.

AMERICAN GAS COMPANY

Constructors of Coal Gas Apparatus.

EASTERN AGENTS FOR

BREDEL'S SYSTEM
COAL GAS PLANTS AND GAS APPARATUS.

P. H. & F. M. ROOTS CO.'S
Exhausters, Governors, etc.

GENERAL AGENTS FOR

BRONDER'S CHARGING AND DISCHARGING MACHINES.

MANT'S PATENT COKE SPLITTER.

AMERICAN GAS COMPANY,

222 South Third Street, Philadelphia, Pa.

FRED. BREDEL, C.E.

Coal and Water Gas Plants.

OWN SYSTEM.

RECUPERATIVE FURNACES, WASHERS, CONDENSERS, PURIFIERS, PURIFYING MACHINES, COKE CONVEYERS, ETC.

SOLE UNITED STATES AGENT FOR
ARROL-FOULIS MECHANICAL CHARGING AND DRAWING MACHINES.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas.

GAS RETORTS AND SPECIAL BLOCKS AND FIREBRICK MANUFACTURED UNDER THE SUPERINTENDENCE OF MY OWN CHEMIST.

COMPLETE GAS WORKS

No. 118 Farwell Avenue, · Milwaukee, Wis.

Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa.

ROOTS'

LATEST IMPROVED GAS EXHAUSTER

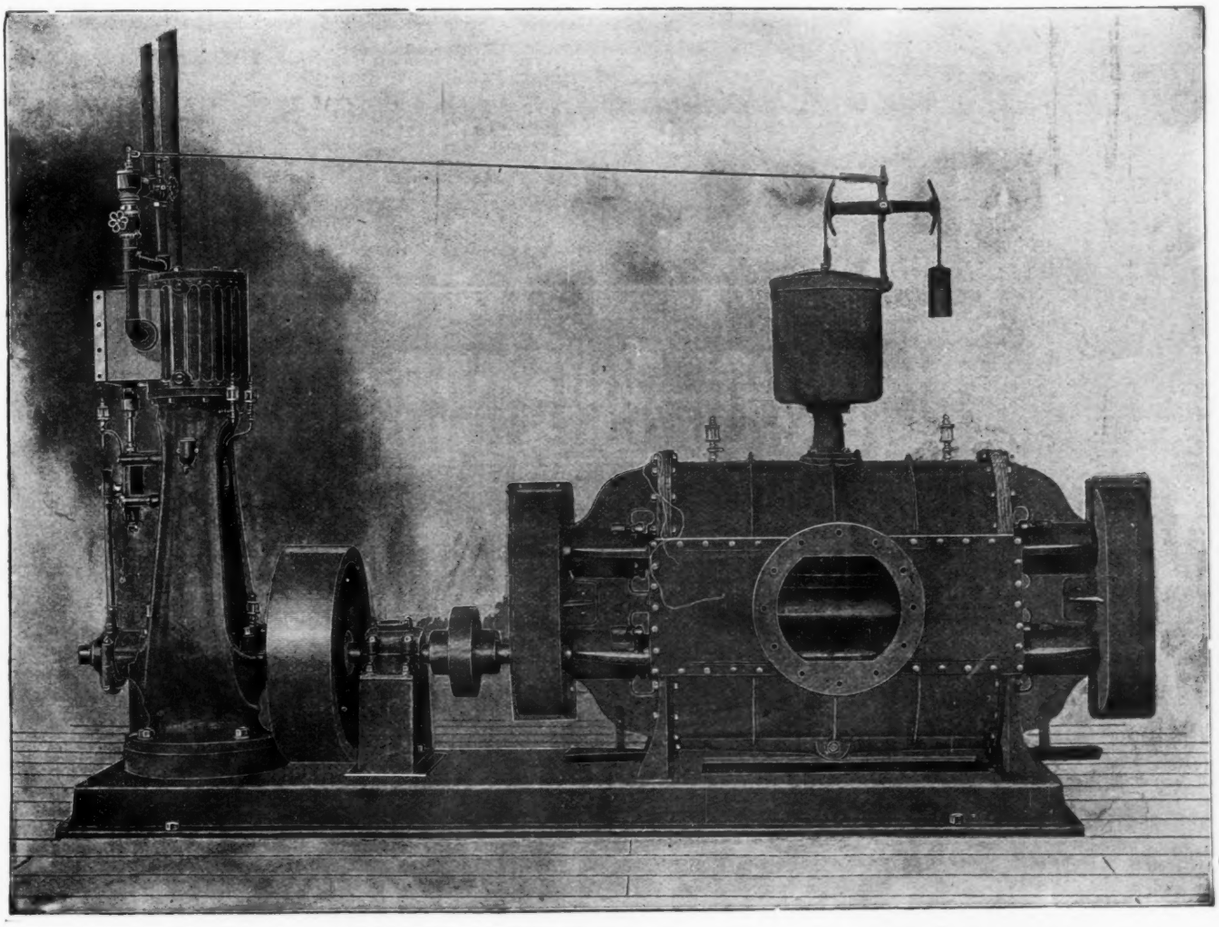
—AND—

NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



INQUIRIES CHEERFULLY ANSWERED. WRITE FOR CATALOGUE.

P. H. & F. M. ROOTS CO.,

Connersville, Ind. **109 Liberty St., New York.**

Eastern Office:

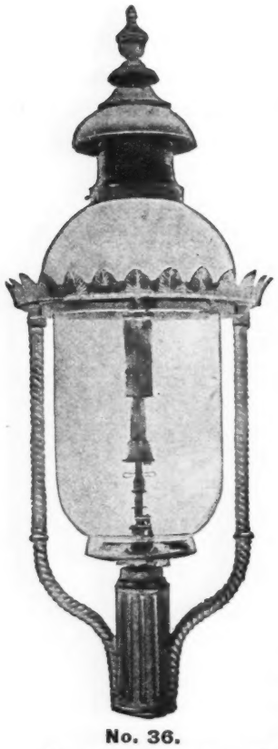
American Gas Company,

222 South Third Street, Philadelphia, Pa.

NEW YORK, 33 Nassau St. PHILADELPHIA, Broad and Arch Sts. CHICAGO, 54 Lake St.

Welsbach Street Lighting Company

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in seventy-five Cities and Towns.

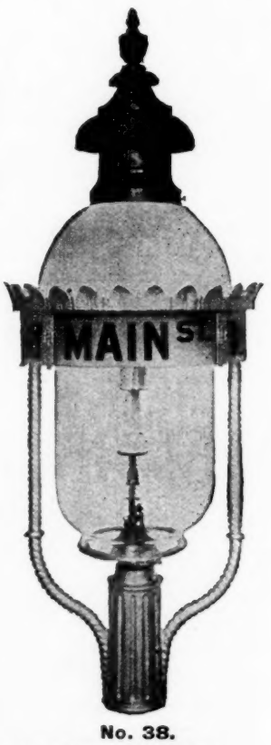
By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.



No. 38.

Correspondence solicited from Gas Companies and others interested in Municipal and outside lighting.

NOW READY.

THE SIXTH (AND CENTENARY) EDITION

— OF THE —

Handbook for Gas Engineers and Managers.

By THOMAS NEWBIGGING, M. Inst. C.E.

This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions. Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

PRICE, - - $6.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, N. Y. City.

PRACTICAL HANDBOOK ON

GAS ENGINES

With Instructions for Care and Working of the Same.

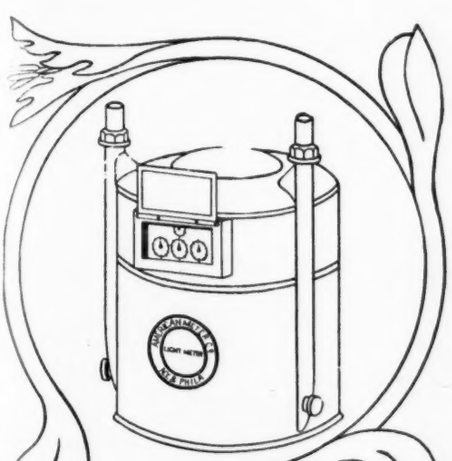
By G. LIECKFELD, C.E.

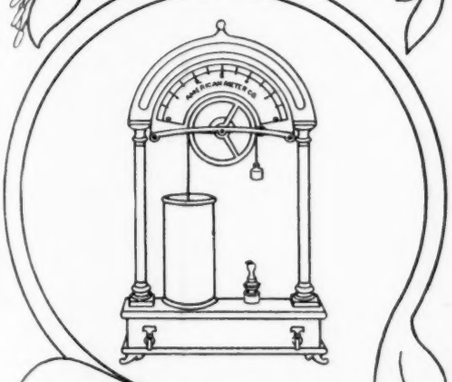
Translated with Permission of the author by GEO. M. RICHMOND, M.E.

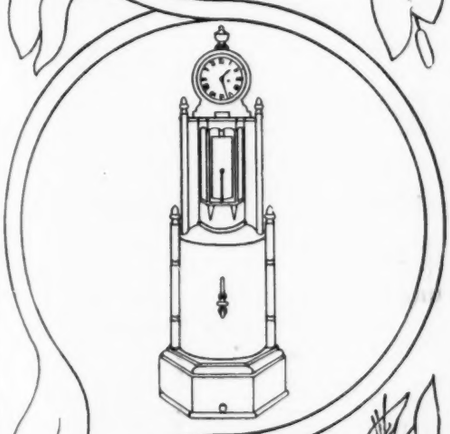
Price, $1.00.

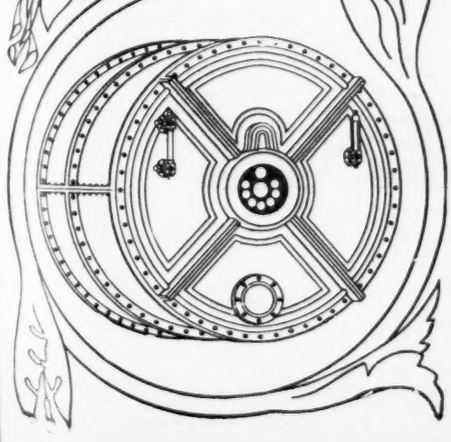
A. M. CALLENDER & CO., 32 Pine Street, New York.

(Copyrighted, 1894, by the AMERICAN METER CO.









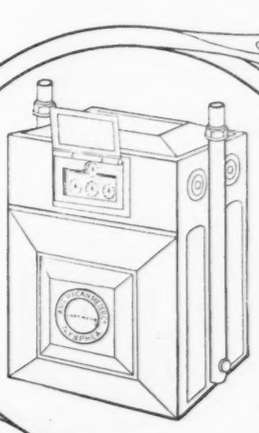
AMERICAN METER CO.

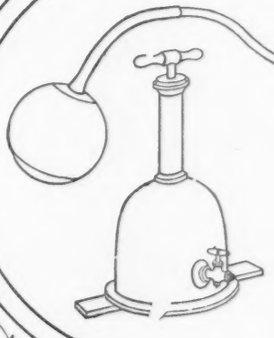
ESTABLISHED 1834. INCORPORATED 1863.

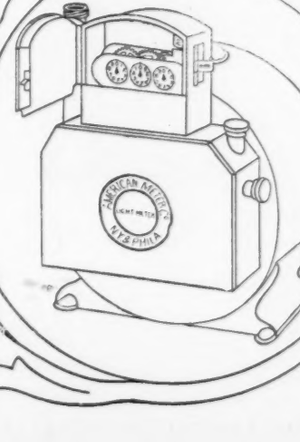
NEW YORK AND PHILADELPHIA,

CHICAGO, ST. LOUIS,

SAN FRANCISCO.







PUBLIC LIGHTING TABLE.

JULY, 1900.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Sun.	1	9.00 PM	3.40 AM	7.30	3.15
Mon.	2	9.30	3.40	7.30	3.15
Tue.	3	10.00	3.40	7.30	3.15
Wed.	4	10.20 FQ	3.40	7.30	3.15
Thu.	5	10.50	3.40	7.30	3.15
Fri.	6	11.20	3.40	7.30	3.15
Sat.	7	12.00	3.40	7.30	3.15
Sun.	8	12.50 AM	3.40	7.30	3.15
Mon.	9	1.40	3.40	7.30	3.15
Tue.	10	2.40	3.40	7.30	3.15
Wed.	11	No L.	No L.	7.30	3.15
Thu.	12	No L. FM	No L.	7.30	3.15
Fri.	13	No L.	No L.	7.30	3.15
Sat.	14	8.00 PM	9.40 PM	7.30	3.15
Sun.	15	8.00	10.20	7.30	3.15
Mon.	16	8.00	10.50	7.20	3.15
Tue.	17	8.00	11.20	7.20	3.15
Wed.	18	8.00 LQ	11.40	7.20	3.15
Thu.	19	8.00	12.50 AM	7.20	3.15
Fri.	20	8.00	1.20	7.20	3.15
Sat.	21	8.00	2.00	7.20	3.15
Sun.	22	7.50	3.00	7.20	3.15
Mon.	23	7.50	3.50	7.20	3.15
Tue.	24	7.50	3.50	7.20	3.15
Wed.	25	7.50	3.50	7.20	3.15
Thu.	26	7.50 NM	3.50	7.20	3.15
Fri.	27	7.50	3.50	7.20	3.15
Sat.	28	7.50	3.50	7.20	3.15
Sun.	29	7.40	4.00	7.20	3.15
Mon.	30	7.40	4.00	7.10	3.30
Tue.	31	8.20	4.00	7.10	3.30

TOTAL HOURS LIGHTING DURING 1900.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	230.50	January	423.20
February	175.40	February	355.25
March	189.00	March	355.35
April	160.30	April	298.50
May	150.40	May	264.50
June	137.00	June	234.25
July	152.00	July	243.45
August	171.50	August	280.25
September	187.20	September	321.15
October	213.10	October	374.30
November	221.50	November	401.40
December	231.50	December	433.45
Total, yr.	2221.40	Total, yr.	3987.45

"YUSEA"

The box with the perforated seal—
The name on the mantle—
are two ways of telling the genuine

"YUSEA" Welsbach MANTLE

A brilliant light and a long life
are two other ways.
Once used, always used.
See that you get the genuine.
Sold Everywhere. Price 50 cents.

WELSBACH COMMERCIAL CO., PHILADELPHIA.

"Y-USE-A"

Remember the name, and don't forget the box

THE UNITED GAS IMPROVEMENT COMPANY.

THE STANDARD JUNIOR,

THE STANDARD DOUBLE SUPERHEATER,

LOWE WATER GAS APPARATUS.

Total Sets Installed to January 1, 1900, - - - - - - - - 327

Total Daily Capacity - - - - - - - - - 207,425,000 Cu. Ft.

WATER GAS PLANT AS AUXILIARY TO COAL GAS WORKS.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY Prest. DAVID R. DALY V. Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

E. D. WHITE, President. A. H. GUTKES, Vice-President. H. A. PERKINS, Secretary.

Brooklyn Fire Brick Works,

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St. Brooklyn, N. Y.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of { CAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Proprietors for the U. S., Coze System of Inclined Benches.

Estimates Furnished on Application for Most Successful Style of Construction.

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

Office:
914, 915 & 916 Wainwright Building, St. Louis, Mo.

The Construction of Gas Works

PRACTICALLY DESCRIBED,

By WALTER RALPH HERRING.

Price $2. For Sale by

A. M. CALLENDER & CO.,

32 Pine Street, N. Y. City.

Adam Weber,

Proprietor,

Manhattan Fire Brick and Enameled Clay Retort Works.

Works, Weber, N. J.
Office, 633 East 15th St., New York.

Modern Recuperative Furnaces
And Standard Fire Brick and Gas Retorts.

Works,
LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR., CO.,

Hamilton Building, Fifth Avenue,
PITTSBURGH, PA. P. O. Box 373.

Successor to WILLIAM GARDNER & SON,

Fire Clay Goods for Gas Works.

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY
RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,
BENCH SETTINGS,
Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. Galesburg or Brooklyn.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

Eastern Agent, GEO. P. WARRINER, 675 Bedford Ave., BROOKLYN, N. Y.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec.
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE
RETORT & FIRE BRICK CO.

MANUFACTORY AT
LOCUST POINT BALTIMORE MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12 x 12 x 2 and 10 x 10 x 2.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

JOHN DELL,
General Manager.

MISSOURI FIRE BRICK CO.,

ESTABLISHED 1882.

MANUFACTURERS OF

Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are prepared to furnish and erect COMPLETE, Half and Full Depth Benches of 6's, 8's, 9's, with Regenerative Furnaces, Constructed to Burn either Coal or Coke. Also Plain Benches.

CORRESPONDENCE IS RESPECTFULLY SOLICITED.

{ CITY OFFICE: 411 Olive St., Continental Bank, } ST. LOUIS, MO.

National Gas and Water Company.

CONTRACTORS FOR
Gas Plant Machinery

SOFT COAL OR COKE
WATER GAS GENERATORS
A SPECIALTY.

218 LA SALLE ST.,
CHICAGO.

Gas Engineers
INSPECTION AND ADVICE.

PLANS AND ESTIMATES
FOR IMPROVEMENTS OR
REPAIRS.

CONNELLY IRON SPONGE AND GOVERNOR CO.

(Successors to CONNELLY & CO.)
MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR. OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT! WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION! REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE! IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 357 Canal St., New York.

Hughes' "Gas Works,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by
WM. RICHARDS, C.E.

Eighth Edition, Revised, with Notices of Recent Improvements.

Price, $1.65.

A. M. CALLENDER & CO.,
32 Pine St., N. Y. City.

Parson's Steam Blower

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

H. E. PARSON, Supt., 457 Putnam Ave., Brooklyn, N. Y.

The Chemistry of Illuminating Gas,

By NORTON H. HUMPHRYS. Price, $2.40.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY.

The Gas Engineer's Laboratory Handbook,

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine Street N Y. City.

Practical Hints on the Construction and Working of Regenerator Furnaces,

By MAURICE GRAHAM, Assoc. M. Inst. C.E.

Price, $1.25. For Sale by

A. M. CALLENDER & CO., No. 32 Pine Street, New York City.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

SCIENTIFIC BOOKS.

GAS MANUFACTURE, THE CHEMISTRY OF, by W. J. A. Butterfield. $3.50.

NEWBIGGING'S HANDBOOK. By Thos. Newbigging. 6th edition. $6.

COX'S GAS FLOW COMPUTER. $2.50.

FIELD'S ANALYSIS, 1898. $5.

HUGHES' GAS WORKS. $1.65.

POOLE ON FUELS. By Herman Poole. $3.

GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor. $3.50.

TECHNICAL GAS ANALYSIS. $3.

GAS CONSUMER'S HANDYBOOK, by Wm. Richards. 20 cents.

CHEMISTRY OF ILLUMINATING GAS. By Norton H. Humphrys. $2.40.

PRACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.

PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

HEMPEL'S GAS ANALYSIS, $2.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

COAL: Its History and Use. By Prof. Thorpe. $3.50.

PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfield. $1.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.

GASFITTER'S GUIDE, by John Eldridge 40 cents.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2

CONSTRUCTION OF GAS WORKS, by Walter Ralph Herring. $2.

DIGEST OF GAS CASES. $5.

PRACTICAL HINTS ON REGENERATOR FURNACES By M. Graham. $1.25.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5

GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby. $2.50.

GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.

PRACTICAL PLUMBING. By P. J. Davies. $3.

AMERICAN PLUMBING. By Alfred Revill. $2.

CEMENT; A Manual of Lime and Cement, their Treatment and Use in Construction. By A. H. Heath. $2.50.

A COMPARISON BETWEEN THE ENGLISH AND FRENCH METHODS OF ASCERTAINING THE ILLUMINATING POWER OF COAL GAS. $1.60.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Kapp. $3.50.

ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.

ELECTRIC LIGHTING, by Francis B. Crocker. $3.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

A. M. CALLENDER & CO., 32 Pine Street, New York.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, - - Clarksburgh, Harrison Co., West Va.
WHARVES, - - - Locust Point Baltimore, Md.
OFFICE, - 640 Equitable Building Baltimore, Md.

ROUSSEL & HICKS, 71 Broadway, N. Y. } *AGENTS,* { BANGS & HORTON 60 Congress St., Boston.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

Do You Wish to Know

what size of pipe to use to convey any quantity of gas, any distance, with any loss of pressure and any initial or final pressure? Then use

Cox's Gas Flow Computer,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50. For sale by

A. M. Callender & Co., 32 Pine St., N. Y.

GREENOUGH'S "DIGEST OF GAS CASES."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO., 32 Pine St., N. Y.

MADEIRA, HILL & CO.,

INCORPORATED.

MINERS AND SHIPPERS

Anthracite and Bituminous Coal and Coke.

GENERAL EASTERN SALES AGENTS

PENN GAS COAL CO.

OPERATING THE FAMOUS MINES IN THE

YOUGHIOGHENY COAL BASIN.

OWNERS OF OVER 1,000 COAL CARS.

COAL CAREFULLY SCREENED AND PREPARED FOR GAS PURPOSES.

OFFICES:

PHILADELPHIA, 1438 South Penn Square. BOSTON, 70 Kilby Street. NEW YORK, 143 Liberty Street.
BRIDGEPORT, CONN. READING, PA.

EDMUND H. McCULLOUGH, Prest. CHAS. F. GOEHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE SUN OIL CO.,

Crude Oil, Gas Naphtha,
Refined Petroleum, Gas Oil.

Toledo, O., and Pittsburgh, Pa.

Standard Oil Company,

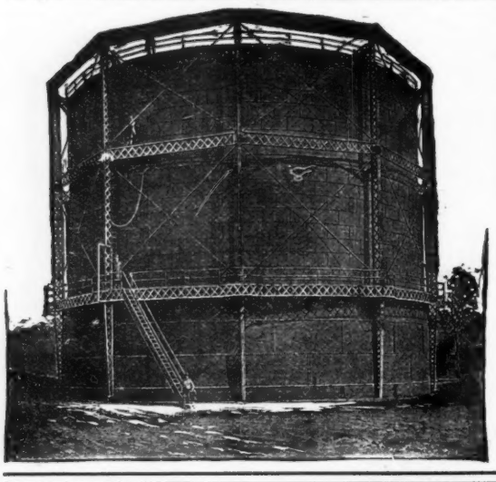
GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.



DAVIS & FARNUM MFG. CO.,
WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

BAXTER & YOUNG,
CONTRACTING AND CONSULTING GAS ENGINEERS.

Examination and Values Ascertained of Artificial and Natural Gas Properties.

COMPLETE GAS WORKS ERECTED.

Artificial and Natural Gas Mains Furnished and Laid.

CORRESPONDENCE SOLICITED.

OFFICE : WAYNE COUNTY BANK BUILDING,
Rooms 201 & 202. DETROIT, MICH.

A. E. BOARDMAN, C. E.,
Consulting and Contracting Engineer.

Particular attention given to Gas, Water and Electric Plants. Long and successful experience with the problem and practice of

Filtration for Public Water Supply.

BREVARD, N. C.

JAMES T. LYNN,
GAS ENGINEER
AND
CONTRACTOR,

Wayne Bank Building, - DETROIT

GAS PROPERTIES PURCHASED.

Geo. Shepard Page's Sons.
GAS MACHINERY.

Correspondence Solicited.

180 Fulton Street, New York City.

DAVID LEAVITT HOUGH,
Consulting Engineer
AND
CONTRACTOR,
374 FIFTH AVE., N. Y

Kerr Murray Manufacturing Company,

Steel Gasholder Tanks,

SINGLE, DOUBLE AND TRIPLE-LIFT GASHOLDERS,

HORIZONTAL AND VERTICAL STORAGE OIL TANKS

Iron Work for Coal Gas Benches, Self-Sealing Mouthpieces, Exhausters, Condensers, Scrubbers, Purifiers, Wooden Trays, Floor Carriages, Center Seal and Valve System Connections, Cast and Wrought Iron Fittings, and Connections 3 to 36 Inches Diameter.

VALVES, Double Gate, Hub and Flange, Outside Screw and Quick Opening, 3 to 36 In. Diam.

COAL AND COKE WAGONS, RETORT HOUSE TOOLS, STREET MAIN SPECIALS AND DRIPS.

Address,

KERR MURRAY MANUFACTURING CO.
Fort Wayne, Indiana.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Triple, Double and Single-Lift Gasholders.

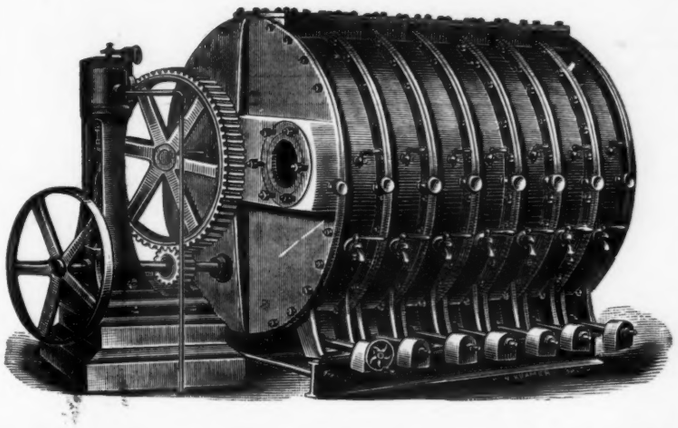
Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS

PURIFIERS.



CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS

Boilers.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSABLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

ALEX. C. HUMPHREYS, M. E., M. Inst. C. E. ARTHUR G. GLASGOW, M. E., M. Inst. C. E.

HUMPHREYS & GLASGOW,

BANK OF COMMERCE BLDG.,
31 Nassau Street,
New York.

9 VICTORIA STREET
London S. W.,
England.

CONSULTING GAS ENGINEERS
AND MANAGERS.
GAS PROPERTIES PURCHASED.

GASHOLDER TANKS AND
GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,
238 Java Street, Brooklyn, N. Y.

GEORGE R. ROWLAND.

Formerly with the Continental Iron Works.

Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.

R. D. WOOD & CO.,

ENGINEERS, IRON FOUNDERS, MACHINISTS.

400 Chestnut Street, Philadelphia, Pa.,

MANUFACTURERS OF

CAST IRON PIPE.

BUILDERS OF

Gas Holders,

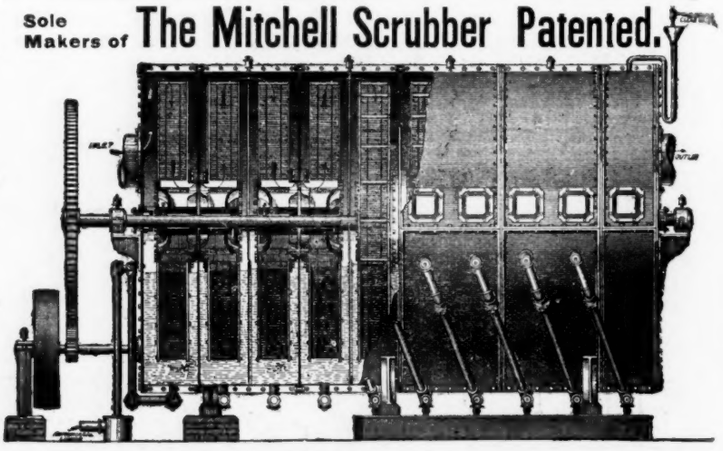
Single, Double and Triple Lifts, with or without Wrought Iron or Steel Tanks,

PURIFIERS, CONDENSERS, SCRUBBERS.

Send for Pamphlet.

Dunham Patent Specials.

Sole Makers of **The Mitchell Scrubber Patented.**



ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

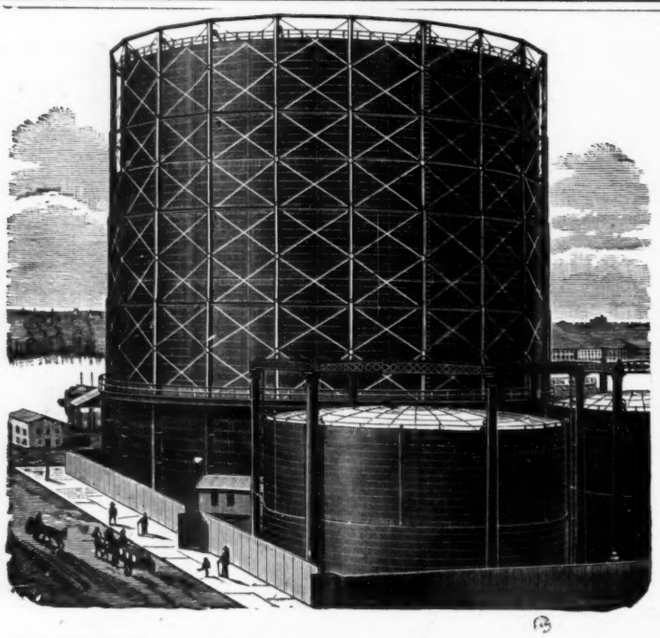
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

245 Broadway, New York City. —OFFICES— **Bridge & Ogden Sts., Newark, N. J.**



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, Jr., Secretary & Treasurer.

West and Calyer Sts. (Near 10th & 23d St. Ferries)
NEW YORK, Borough of Brooklyn.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

ILLUMINATING GAS! FUEL GAS!

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cuttlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

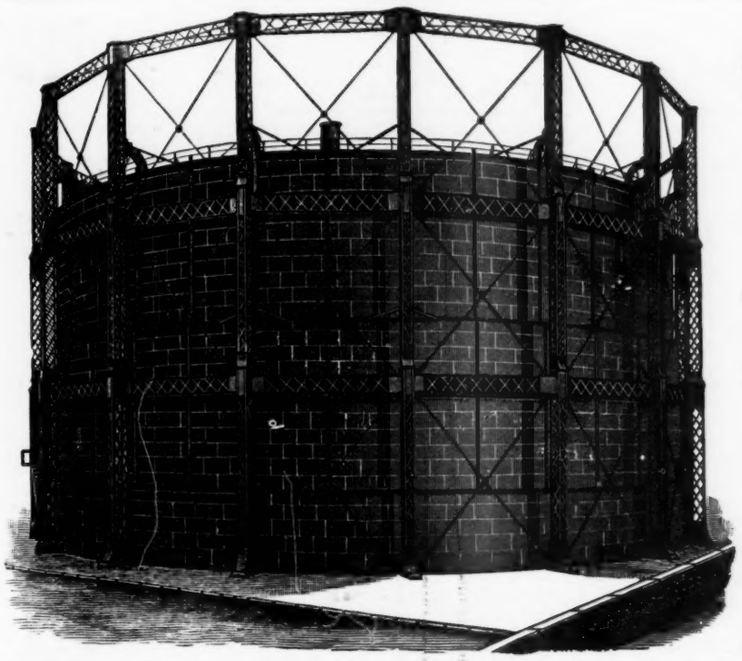
BURDETT LOOMIS, - Hartford, Conn.

To Gas Companies.

We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

Also SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,
248 N. 8th St., Phila., Pa.



H. RANSHAW, Prest. & Mangr. T. H. BIRCH, Asst. Mangr.
WILLIAM STACEY, Vice-Prest. R. J. TARVIN, Sec. & Treas.

THE STACEY MANUFACTURING CO.

Established 1851.

Single, Double and Triple-Lift

GASHOLDERS,

Of any Capacity, with or without Wrought Iron or Steel Tanks.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, etc.

Coal Gas Benches, Roof Frames,

OIL STORAGE TANKS.

Pressed Steel Mouthpiece Lids, Self-Sealing Mouthpiece Lids.

General Office: Cincinnati, O.
Eastern Office: 911 Drexel Building, Philadelphia, Pa.

RITER-CONLEY MFG. CO.,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

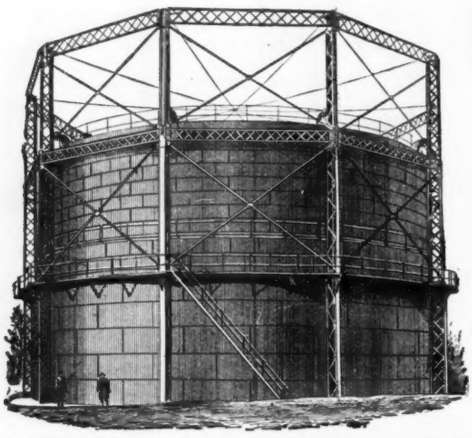
Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited.
Plans and Estimates Furnished.

1900 DIRECTORY 1900

OF AMERICAN GAS COMPANIES.

Price, - - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.



1842 ※ Deily & Fowler, ※ 1900

LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.

James R. Floyd's Sons,

FREDERICK W. FLOYD, President.
HENRY E. FLOYD, Vice-President.
JAMES R. FLOYD, Jr., Sec'y & Treas.

531 to 543 West 20th Street and 530 to 540 West 21st Street, N. Y.

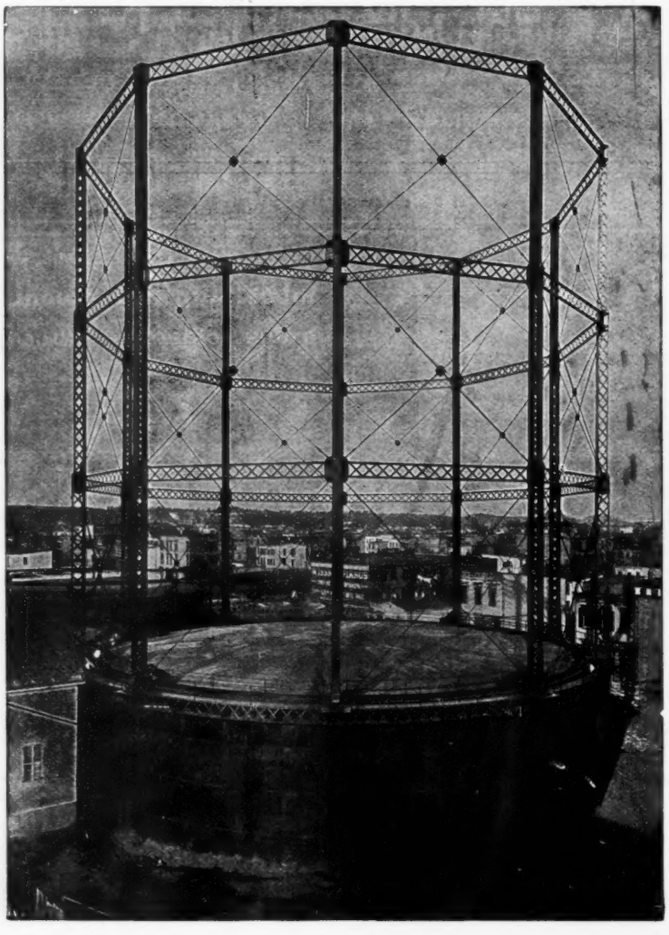
Engineers and Contractors for the Construction of Gas Works.

MANUFACTURERS OF

All Kinds of Castings and Iron Work for Gas Apparatus.

ESTABLISHED 1856.
INCORPORATED 1899.

Write for Estimates to
530. West 20th St., New York City.



The order for this Triple-Lift Holder and Steel Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 Cu. Ft.

LOGAN IRON WORKS,

Brooklyn, N. Y.

MANUFACTURERS OF

Single or Multiple-Lift

GASHOLDERS,

Complete with Steel Tanks.

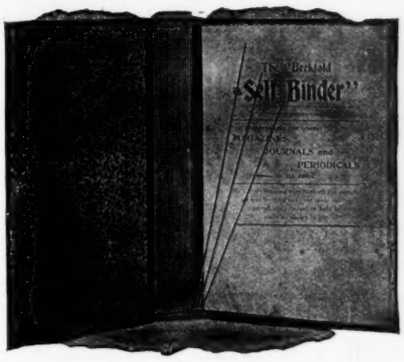
BENCHES, SCRUBBERS,
CONDENSERS,
PURIFIERS, IRON ROOFS,
Self-Sealing Retort Lids,
AND ALL PARTS OF
GAS WORKS APPARATUS.

Contractors for
Complete Works.

ALSO, SOLE MANUFACTURERS OF

C. W. BLODGET'S
HOT GAS SCRUBBER.

BINDER for the JOURNAL.



Price $1.00.

A. M. CALLENDER & CO., 32 Pine Street, N.Y.

—THE—

Valuation of Gas, Electricity and Water Works

FOR ASSESSMENT PURPOSES.

SECOND EDITION.

By THOS. NEWBIGGING, M.Inst.C.E., and WM. NEWBIGGING, Assoc.M.Inst.C.E.

With an Appendix of Decided Cases.

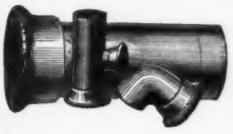
Price $2. For Sale by

A. M. CALLENDER & CO.,
32 Pine Street, N. Y. City.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.



CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Brancher, Bends, Retorts, etc., etc.

"GLOBE SPECIALS, VALVES, ETC." M. J. DRUMMOND & CO. "GLAMORGAN" PIPE AND SPECIALS

MANUFACTURERS OF

CAST IRON FLANGE GAS AND WATER PIPE

GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.

Western Office: Monadnock Block, Chicago, Ills.

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

CHARLES MILLER & SON CO., Selling Agents, Utica, N.Y.

Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.

Manufacturers of Lead Pipe, Solder, etc., and Jobbers of Plumbers' and Tinners' Goods.

CAST IRON PIPE and SPECIALS FOR WATER AND GAS.

Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

Established 1854.

D. McDONALD & CO.,

MANUFACTURERS OF

WET AND DRY METERS, STATION METERS AND METER PROVERS.

ALSO MAKERS OF

THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES

OVER 50,000 OF THESE METERS,

ALL OF WHICH ARE GIVING PERFECT SATISFACTION.

Correspondence Solicited.

561 West Forty-seventh Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | 34 & 36 West Monroe Street, CHICAGO.

Established 1849. With the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS METER CO.,

8 Medford Street, Boston, Mass.

MANUFACTURERS OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Prepayment Gas Meters.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 107 West Monroe St.**

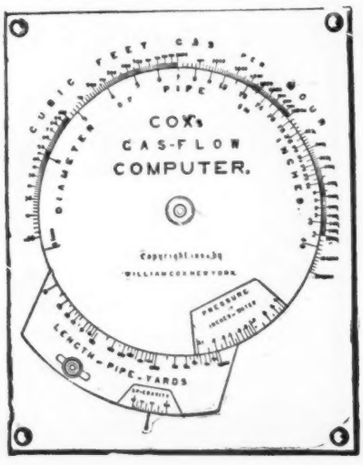
SAN FRANCISCO, 221 Front St.

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

"Perfect" Gas Stoves

KEYSTONE METERS, CAREFULLY MADE.

The KEYSTONE METER CO., Royersford, Pa. and WIESTER & CO., 22 Second St., San Francisco.



Do you wish to Know

what size of Pipe to use to convey any quantity of Gas, any distance, with any loss of pressure, and any initial or final pressure? Then use

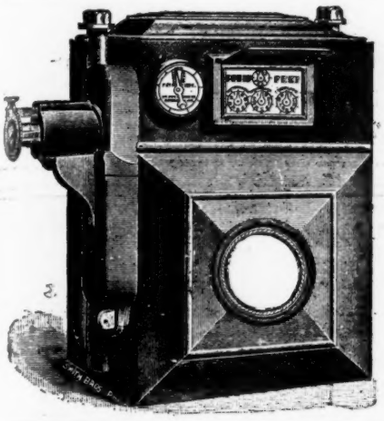
COX'S GAS FLOW COMPUTER,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50.

For sale by

A. M. CALLENDER & CO., 32 Pine St., N. Y. City.



AMERICAN METER COMPANY,

NEW YORK, PHILADELPHIA, SAN FRANCISCO.

PREPAYMENT METERS.

THEIR CONSTRUCTION IS SUCH THAT THEY MAY BE READILY READJUSTED WHEN THE SCALE OF GAS RATES IS CHANCED.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

THEODORE D. BUHL, President. CHAS. H. JACOBS, Secretary-Treasurer.

DETROIT METER COMPANY,

DETROIT, MICH.

MAKERS OF...

GAS METERS.

OUR equipment embraces the Latest and Most Improved Machinery. We make our own Tin Plate. We claim for "BUHL" METERS, **Increased Durability,** with probability of **Fewer and Less Expensive Repairs,** and **More Accurate Adjustment.** Comparisons invited. Meters of other Makers promptly Repaired.

MAIL ORDERS SOLICITED.

The Advertisement of

JOHN J. GRIFFIN & CO., Mfrs. of Gas Meters, etc.,

Nos. 1513, 1515, 1517, 1519 & 1521 Race Street, Philadelphia,

52 Dey Street, New York, 75 N. Clinton Street, Chicago,

Occupies this space every alternate week.

THE WESTERN GAS CONSTRUCTION CO., FORT WAYNE, IND.

IMPROVED

COAL GAS APPARATUS,

COMPLETE SYSTEM OF

Exhausters, Condensers, Tar Extractors, Washers, Scrubbers, Tar Separators and Ammonia System,

For the Complete Progressive Treatment of the Gas from the Retort Outlet to the Purifiers.

PURIFICATION.

Ordinary Purifiers and 4-way or Valve Systems. IMPROVED DUPLEX and TWIN PURIFIERS with DUPLEX VALVE for obtaining the maximum efficiency of apparatus and economy in handling materials on minimum capital expenditure.

Coal Gas Bench Castings.

Steel Hydraulic Mains, Self-Sealing and Common Mouthpieces, Steel Tanks, Riveted Steel Pipe, Steel Roofs and Buildings, Street Main Specials, Ammonia Apparatus, Tar Distilling Plants, Rotary Washers, Street Main Governors.

VALVES.

Our PATENTED DESIGN, especially suitable for FOUL MAINS, for Street Mains and Works use. Can be opened, inspected, cleaned and repaired while in place.

Improved Lowe Water Gas Apparatus.

Original Installations and Auxiliary Plants and Designs for Special Situations. All capacities. Over 70 plants installed and in successful operation.

WILLIAM HENRY WHITE,
EASTERN ENGINEER,
32 Pine St., New York.

The Western Gas Construction Co.,
FORT WAYNE, INDIANA.